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PROCESS CONTROL: STEEL'S QUALITY EDGE IN ITS BATTLE TO STAY COMPETITIVE

3 NEW MILLS SPRING FROM THE ASHES OF ANTIQUITY

FOURTH QUARTER FORECAST:
THE FAST RUN IS OVER—NOW FOR THE LONG HAUL

VOL. 226, NO. 25

IRON AGE

OCTOBER 3, 1983

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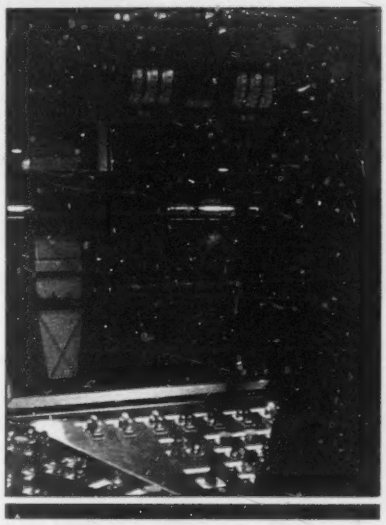

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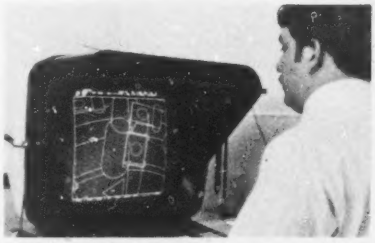

Industrial data base: The key to productivity in the factory of the future.

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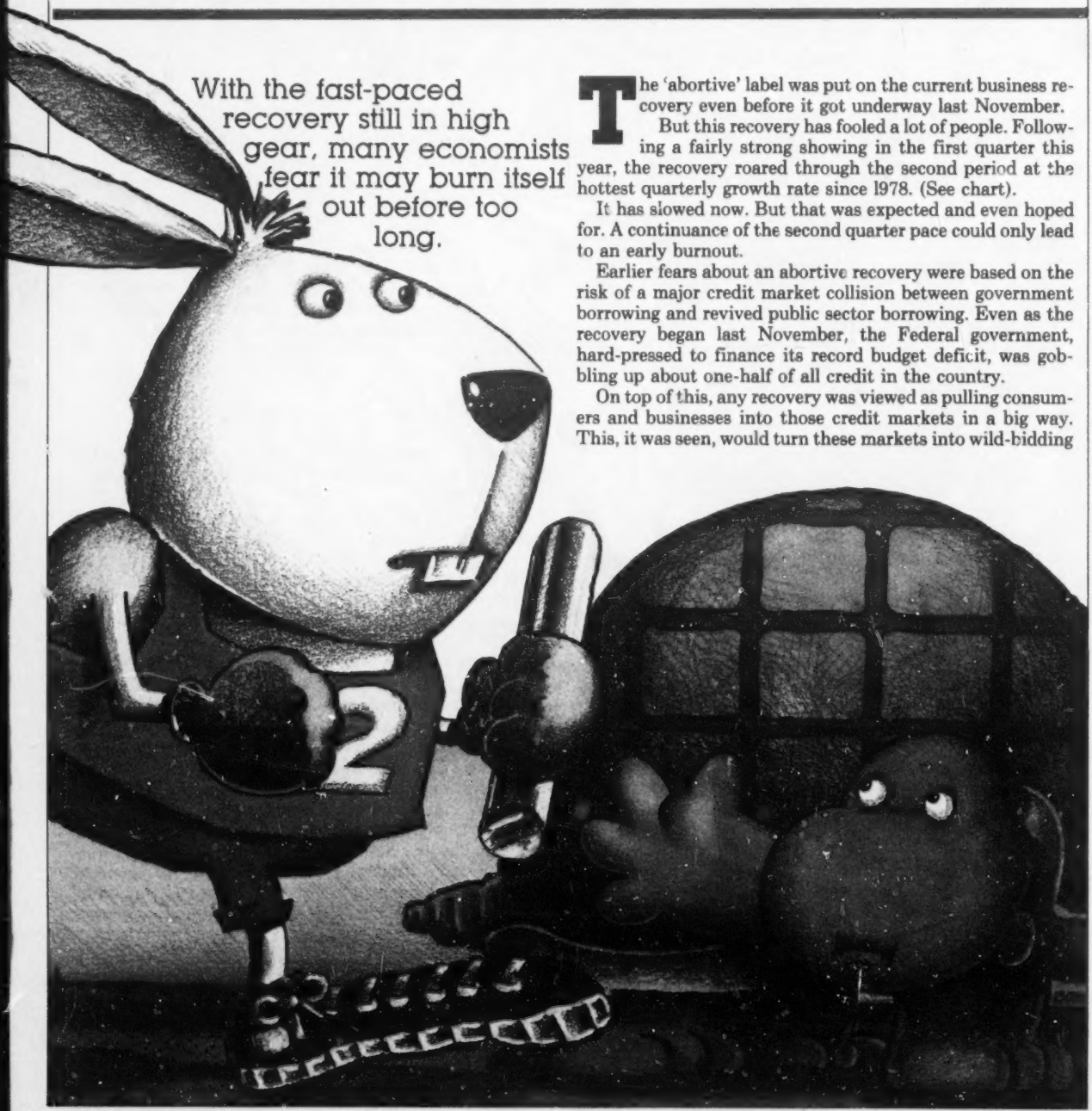
THE FAST RUN IS OVER— NOW FOR THE LONG HAUL

With the fast-paced recovery still in high gear, many economists fear it may burn itself out before too long.



The 'abortive' label was put on the current business recovery even before it got underway last November.

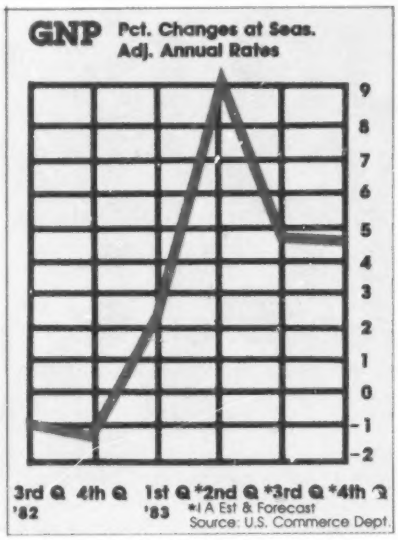
But this recovery has fooled a lot of people. Following a fairly strong showing in the first quarter this year, the recovery roared through the second period at the hottest quarterly growth rate since 1978. (See chart).

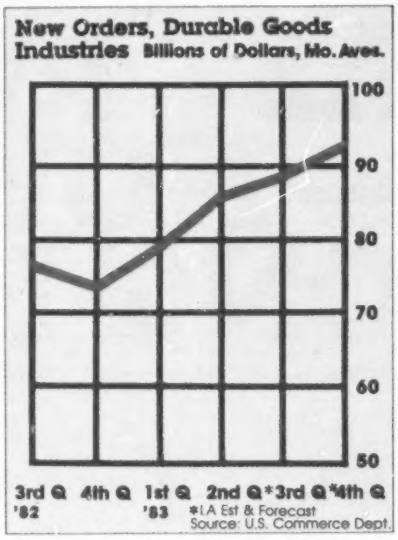
It has slowed now. But that was expected and even hoped for. A continuance of the second quarter pace could only lead to an early burnout.

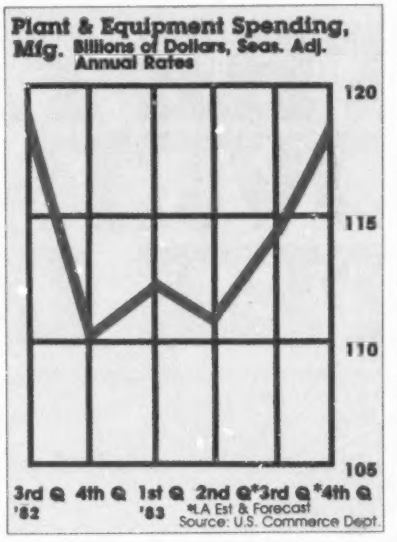
Earlier fears about an abortive recovery were based on the risk of a major credit market collision between government borrowing and revived public sector borrowing. Even as the recovery began last November, the Federal government, hard-pressed to finance its record budget deficit, was gobbling up about one-half of all credit in the country.

On top of this, any recovery was viewed as pulling consumers and businesses into those credit markets in a big way. This, it was seen, would turn these markets into wild-bidding

QUARTERLY FORECAST







auctions with interest rates being pushed through the roof again.

Then...goodbye recovery!

That scenerio has not been played. At least, not yet. And now, there is good reason to believe that drama will not be played out as there is to believe it will come about-at any time.

In short, the recovery could turn out to be a fooler. As one economist wryly notes, "It may be just another in a long line of foolers. We haven't been calling the shots very well over the last few business cycles."

Fears aside, the plain fact is that interest rates over the past three quarters have not taken off even as:

The budget deficit hit record levels;

the trade deficit went deeper into the red than ever in history;

the dollar skyed to levels never before seen.

It seems this recovery has a life of its own. Right now, at least, it appears the recovery will live out that life regardless of all the frets, fears and foibles that surround it.

As has been seen in just about all recoveries, the current one was ignited by consumer buying. This time around, consumers have been spending all they earn, and then digging deep into their savings so they could spend even more.

More than that, consumers in July swelled their net instalment debt by $4.8 billion. That was the biggest monthly increase in such debt since the government began keeping records on it back in 1943.

Consumer spending in the second quarter, in real terms, rose at an annual rate of almost 10 pct. This was the largest quarterly increase in almost 20 years. Savings, as a percent of real disposable income, fell to 4.0 pct-the lowest savings rate since 1950.

All this spending fervor has pushed orders back through the supply pipelines to factories.

New orders received by durable goods producers in July, at $87.7 billion, were up 24 pct from their recession low point of last October. Industrial production in July was up 10.2 pct from its low point of last November-a rollup covering 8 straight months.

No recovery parade is a full-fledged one until business capital spending joins its ranks. As of the second quarter, this happened.

In the June quarter, while the economy grew at an annual rate of 9.2 pct, and consumer spending rose by 9.7 pct, business capital outlays went up 5.9 pct.

Plant outlays are expected to improve as the year moves on. Still, they will be down an estimated 3.1 pct for the full year compared to 1982. That would result in unprecedented back-to-back years of decline in business fixed investment.

Expenditures came to $321.5 billion in 1981, $316.4 billion last year and are expected to come in at $306.6 billion this year. The figure for this year is that given to the U.S. Commerce Department by business executives in the latest survey taken in July and August.

Capital appropriations by the nation's 1000 largest manufacturers were up in the second quarter by 17.6 pct, according to the Conference Board's latest quarterly survey. (That is for non-petroleum firms. If petroleum firms are included, the rise was 3.9 pct).

The other sign pointing to an increase in investment volume is the previously noted in Commerce's survey of executives' spending plans. Notably, while spending for the year 1983 will be down from a sour 1982, the rate of spending will be progressively stepped up.

So, capital spending will be joining the recovery parade, and will be enhancing the durability of the recovery. But it will take time for plant investment to mature. If the recovery does abort for any reason-as many still fear-capital investment could possibly not blossom at all in this cycle.

In the larger economic setting in which metals producing and metalworking industries will be operating through the rest of this year, most economists read good signs.

The current quarter will be the fourth straight one showing real growth. Plant capacity utilization rates are running at about 77 pct, up from a recession low point of 62.3 pct last November. The rate has now gone up for 8 straight months.

Importantly, a head of steam to support the economy through 1984 is shaping up in corporate profits. In the second quarter, after-tax earnings were up 15 pct from the opening period.

The profit gain is really better than it looks. The quality of profits has improved as inflation rates have diminished. This has happened because reported profits don't have anywhere near the 'bloat' they previously had in inventory valuations and depreciation. In short, inflation-created 'paper profits' aren't there as they were for a long time. □

John Baxter

QUARTERLY FORECAST

Steel

The steel market is probably trending upward.

Sheet products, after a summer dip, have come back nicely. Improved orders for bars and some tubular products suggest that the recovery is broadening.

This activity should lift steel shipments from about 17 million tons in the third quarter to about 18 million tons in the fourth quarter. When steel people look back on 1983, it will probably be clear that a slow, steady recovery continued in the fourth quarter.

As of late September, however, the only clear picture was that the volume of sheet producers had risen sharply. This rise is powered by the auto industry and depends on the daily car sales of auto companies.

There has been no significant improvement in the demand for plates, structurals and other products tied to capital spending. In the absence of such an improvement, the steel industry recovery has to be considered partial and fragile. With the December slowdown not too far off and auto sales lagging a little, it's possible the recovery will be aborted.

It's also possible that steel imports may be due for another surge. More than 1.4 million tons of steel were imported in July. That was the highest total since August 1982. A growing concern is the tonnage coming from developing nations. The 558,000 tons from these countries in July exceeded the totals of Japan and Europe.

In addition, Canada shipped 214,000 tons into the U.S. That wasn't too far below the 297,000 tons from Europe. The volume from Canada and developing nations figures to strain the agreement limiting European tonnage and any voluntary restraint by the Japanese.

Domestic trade specialists hear reports that larger quantities of foreign steel are on their way to the U.S. Further strains may develop if the proposed agreement between United States Steel Corp. and British Steel Corp. goes through. This calls for 3 million tons of semifinished material a year to be shipped to U.S. Steel's Fairless Works.

The U.S. Commerce Department has noted that this tonnage would nearly double the volume imported from Europe. The effect, said a Commerce official, could wipe out the current agreement on European tonnage.

In the domestic market, the sheet situation is puzzling. Most sheet producers say they are solidly booked for the next 45 days on cold rolled and galvanized sheet. There are reports that two or more mills are having production problems and have fallen behind on deliveries. General Motors Corp. has lost production due to late deliveries. One General Motors stamping plant recently ran completely out of one-sided galvanized sheet.

Nevertheless, the sheet mills are having trouble collecting prices. There is a general lack of enthusiasm about the market picture. This is partly due to the weakness of the non-sheet business; most of the sheet producers have other products.

But in the past, the auto industry almost singlehandedly had produced steel booms. In peak 1979 months, more than 2 million tons of steel were taken in by auto plants. That compares with 1 million tons in June, the best month for which 1983 figures are available.

The puzzle is why there should be a tight supply and full books with demand running at only about half of past capacity. Part of the answer may be that today's capacity is considerably less than that of a few years ago. National Intergroup, for one, has cut its effective capacity by 50 pct. Others are determined to use only their most efficient facilities.

Another explanation may be that the whole supply chain for sheet is reacting slowly to the transition from a depressed state to a moderately strong market.

The steel companies have reduced their inventories and want to keep them down. Pricing problems are blamed partly on the fact that some mills found themselves with excess inventory and a shortage of cash. The inventory was forced on the market by cutting prices.

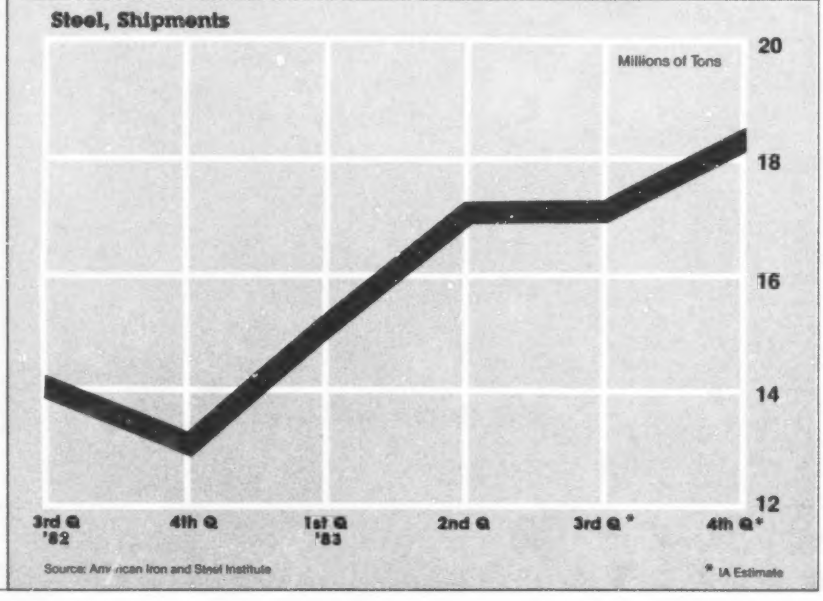
On an overall basis, the steel industry is still depressed. Shipments for the past six months have been at an annual rate of 68 million tons. The fourth quarter will be only a little better and the full year is expected to come in at about 67 million tons.

That isn't enough business to support an industry that has shipped 110 million tons in past peak years and is supposedly capable of shipping 100 million tons today. Inevitably, there are reports of further plant shutdowns and personnel cuts.

The latest report has U.S. Steel shutting down South Works in Chicago and its National and Duquesne plants near Pittsburgh. Permanent job cuts ranging from 5,000 to 10,000 are supposedly in the offing.

To all intents and purposes, some of the affected plants are already down. National Works, which makes pipe and tubing and has been hard hit by the oil country slump, has only 170 active workers. That is down from a normal complement of more than 3,500.

The layoffs have given an unreal quality to some of the labor discussions taking place. At National Works, union members are unhappy with concessions being sought by management. Since most of the union people are idle, it doesn't seem that either side has much to gain or lose.



QUARTERLY FORECAST

Nonferrous

The U.S. business recovery hasn't spread its benefits evenly in the nonferrous metals sector, but laggards like copper, nickel and lead still have some potential for catching up during the fourth quarter.

Aluminum and zinc have been the major beneficiaries of the gradually improving consumption rate by major consuming industries. Both also had been showing a good price recovery rate going into the post-Labor Day stretch. That is expected to carry through to the end of the year.

Copper and nickel were stalled by the narrow focus of the business recovery, which has been most evident in the consumer market and all but invisible in the capital goods sector, which usually picks up the beat in the final third of the year.

The aluminum producers entered September with their published prices for the base 99.5 pct primary unalloyed ingot up to 81¢ per lb. This is one cent higher than the level one domestic producer had reached in 1981, just before the roof started to fall in. Late last year, primary ingot was freely available at and below 45¢ per lb and the sharp recovery in market prices reflects a number of factors, including a low U.S. production rate, some augmenting open market purchases by some domestic producers, a steady downtrend in inventories and a improving industrial chewup rate.

Domestic production has been increasing since before midyear, but the producers still aren't likely to catchup to last year's total until well into the fourth quarter. Meanwhile, there is talk of some supply stringencies next year, based mainly on expectations of further growth in demand and belief that a considerable portion of mothballed capacity won't be reactivated unless prices are high enough to compensate for present and projected high energy costs.

Aluminum scrap prices have moved up sharply in recent months, possibly making some idled primary facilities more attractive alternatives. Scrap aluminum exports are running about 20 pct ahead of the 1982 pace.

Incoming orders for ingot and mill products were running nearly 27 pct ahead of the 1982 pace through the first seven months of the year and industry sources said there was no slackening during the final weeks of summer. Orders for can stock were up about 5 pct, but orders for other sheet and plate items were up a thumping 60 pct. Part of the explanation may be that the Aluminum Association, which reports the incoming order figures, has been including orders for imported can stock in the "sheet and plate, other" category since the start of the second quarter.

Copper prices scored something of a first during the midsummer by slipping below aluminum ingot tags. Copper shipments and demand have improved from a 1982 level, but the consumption rate isn't expected to show real improvement until the capital goods sector revives. Meanwhile, sizable hedge market warehouse inventories bedeviled copper prices right up to Labor Day. Market sources see a fairly rapid pickup in the final quarter, assuming the economic recovery doesn't shift into reverse temporarily, along with the interest rate trend.

A surge in zinc prices during August reflected a combination of tight surplus and an improvement in both demand and consumption, in that order.

The supply situation isn't likely to correct itself soon, because users are trying to put a little extra metal aside. That means further price hikes are in the cards.

Shrinking U.S. zinc capacity has increased dependence on overseas sources. Retrenchment in the European zinc industry and a tightening in availability of zinc concentrates have served to bid up the market.

Lead prices worldwide this year have fallen to levels that could force some shakeouts among producers with less staying power.

About the only item that could be riding to lead's rescue in the short term is a robust storage battery market. The battery makers have been laying in stocks for the upcoming winter season, but it's too early to begin gaging how severe the weather will be.

The export market has been quiet this year, largely because of the absence of the Soviet Union.

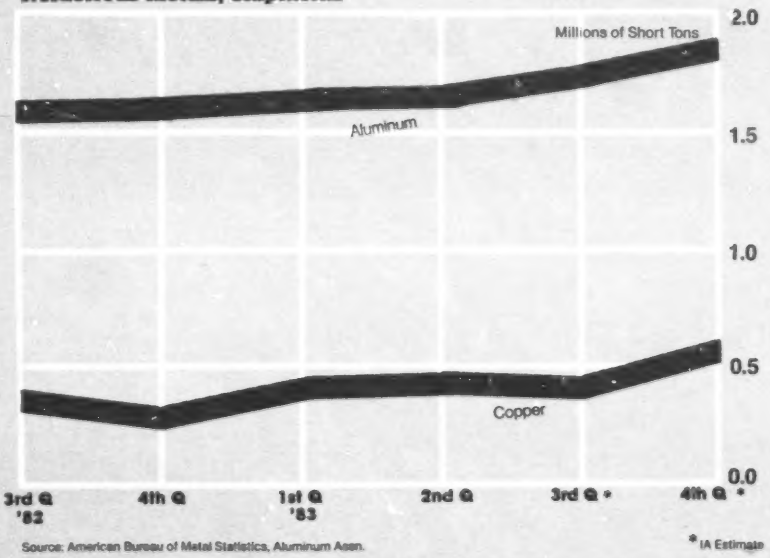
Lead exports had been a sustaining factor for lead prices over a year ago, with Russian buying on Western European markets soaking up a lot of freely available supplies. Although there were reports that Russian lead mines were "maturing" and unable to keep up with domestic requirements, Soviet import requirements appear to have dried up for the time being.

Free market nickel prices began edging up a bit as summer began winding down, but the capital goods markets still were not showing any signs of revival.

Producers' stocks are well below 1982 levels and there is little inclination to break the tight discipline that has been evident in output schedules.

Nonferrous metals industry officials attending the American Mining Congress annual convention in San Francisco in mid-September said they saw only slight improvement for the domestic mining industry in the fourth quarter. Chief obstacles for the copper, lead and zinc producers, they said, were foreign competition, large inventories, a strong dollar and relatively high interest rates.

Nonferrous Metals, Shipments



Source: American Bureau of Metal Statistics, Aluminum Assn.

*IA Estimate

QUARTERLY FORECAST

Auto

Americans probably will buy 1.2 million more passenger cars in 1983 than they did in 1982—6.9 million domestic-made cars, compared with 5.7 million in 1982. Constrained by restraints, imported car sales in 1983 are expected to equal the total sold in 1982: 2.3 million.

U.S. automakers likely will produce 1.9 million passenger cars in the fourth quarter of 1983, after producing 1.6 million in the third quarter. They likely will sell 1.8 million cars in the fourth quarter, after selling 1.7 million in the third quarter.

Auto dealers enter the fourth quarter with about a 55-day supply of cars; 60 to 65 days of inventory is average.

This year the dealers have had shortages of the popular models.

"We are now in the seventh quarter," says the sales analyst of one Big 3 automaker, "of what began as a very weak and grudging pattern of improving domestic sales. Now it's developing into a moderate upturn."

Sales of both domestic and imported cars likely will total 9.2 million in 1983. When total sales exceed 10 million and move toward the 11 million sales of 1979, automakers will be able to say that the recovery has arrived.

Most analysts and executives are predicting more than 10 million total cars sales in 1984.

Car sales climbed each month in the second quarter of this year to a peak 7.5 million seasonally adjusted annual rate (SAAR) in July. That rate is the auto industry's highest monthly total figure since the 8.1 million rate of August 1981, and the 8.6 million rate of January 1980. Sales in both those months, however were inflated by consumer incentive programs.

After fat price hikes each year in the late 1970s, automakers have raised prices in the past three years by much more modest increments. This year they'll raise prices by about 2.5 pct initially and by about 4 pct throughout the 1984 model year.

Consumers have flocked to the more expensive models. They paid 7 pct more for the average 1983 model than for the average 1982 model. Automakers raised the prices of 1983 models over 1982 by 3 pct.

The rise in car sales has been driven by a host of favorable factors: "Lower interest rates, lower unemployment, higher disposable income, an improving economy, much-improved consumer confidence, new cars, and stable gas prices all have increased car sales," says the analyst for one automaker. "I don't see anything on the near horizon threatening the upturn."

Consumer optimism now is at record levels, say forecasters at the University of Michigan. "The personal financial situation of American families," says the survey director, "improved substantially during the past several months due to more favorable income and price trends."

Machine Tools

"You might say we sense it, but we don't see it yet," says one machine tool maker about the recovery.

"We sense it with an increase in orders for perishables. We sense it because we inevitably follow a rebound in our major customers' markets."

Seeing is believing in machine tools and what they aren't seeing yet is a significant increase in domestic business. The numbers are up, but not dramatically and few makers expect any real surge in capital goods until 1984. "We always lag," says one.

Meanwhile, the industry is continuing its lobbying in Washington to stem, at least temporarily, the tide of machine tool imports from Japan and other countries.

Perhaps surprisingly, some machine makers have changed their minds about their chances with the Reagan Administration. They feel that the Administration's sentiments and perceptions of basic industries have been altered in recent weeks.

While the rest of this year may not register big increases in sales of tooling, many in the industry expect next year to be a good year, perhaps a terrific year. That assumes some very large changes in the foreign product situation, they caution.

In a "normal" situation, 1984 would be a banner year, with interest rates relatively low, inflation low, and a high-tech product line offering productivity gains too good to pass up. Unfortunately all of the above is offered at bargain basement prices by offshore competitors. Some lines in the market are already nearly 50 pct foreign and industry sources say they see no reason to believe that the number will stop them.

So, while all the signs say "we sense" the beginning of the real increases in domestic demand for machine tools, what is not seen is whether a number of American tool companies can survive the 1980s without a significant change in the country's policies about foreign economies.

The larger companies are confident of their ability to survive the "Japanese overhang," for example. The larger firms are also capable of capturing a good and healthy share of the flexible machining systems market, here and abroad. And, if automotive opts for FMS technology in a big way, that market will be huge. But, many of the smaller firms are worried. They neither sense nor see a great 1984 unless Washington first senses and sees the need for change in terms of foreign competition.

So, domestic orders will be moving up as 1983 ends. Next year's domestic orders for machine tools could be up dramatically from 1983. The question is whose order books?

QUARTERLY FORECAST

Instruments

The instrument and control industry will remain flat through 1983.

"Shipments will be 1 or 2 pct above last year and that is it," says an industry analyst. "Growth depends to a large extent on plant and equipment expenditures and companies are not spending that money yet."

Despite the economic rebound, there is little evidence that manufacturers have pulled themselves out of the recession enough to begin thinking about buying new equipment. Earliest estimates for industry recovery mention the first quarter of 1984. And if interest rates continue to rise, any pick up in the sales of controls and instruments would be delayed.

"The best you could say about the fourth quarter," reports an industry executive "is that it appears that business has stopped declining."

The manufacturers of some types of equipment are in worse shape than others. "Industrial controls and process control makers still remain in dire straits and business could get worse before it gets better," says an industry spokesman.

Control builders for industries such as oil refining may be looking out several years into the future before business picks up significantly.

The export picture does not look much better than the domestic scene. "The picture looks as bad as ever," says one industry analyst "Exports are down at least 5 pct this year and have been dropping faster in recent weeks." The lack of export sales is critical to the industry, because close to 30 pct of the instrument and controls market is overseas. Imports, on the other hand, are running about 3 pct or 4 pct above last year's totals.

Unlike most U.S. exports, a large quantities of controls go to Third World countries—the major oil producing nations, for example. Europe and Japan might be coming out of a recession, but the developing nations remain mired in it. Western Europe buys only about 20 pct of the instrument and control exports from the U.S., while Japan takes some 15 pct. The remaining markets are scattered throughout the world.

While controls for basic industries like oil, steel and power generation are selling poorly, controls and instruments that go to electronics-related industries are in heavy demand. "Semiconductor test equipment and related products are doing very well," says one industry member. "Environmental controls are not doing so badly either, the expanding housing market has boosted sales of products like thermostats and appliance controls.".

As the economy picks up, that part of the industry which serves the appliance, household and automotive markets is experiencing a recovery.

Computers

In 1982 the computer industry grew 13 pct. In 1983 that growth rate has intensified. By year end, industry sales should be up 18-20 pct above last year's totals.

Third quarter shipments may reach $9 billion, up from a second quarter total of $8.4 billion. The fourth quarter will be even stronger as computer sales, following the lead of the rest of the economy, pick up momentum.

The increasing growth rate is due to the continuing strength of some areas of the industry and a rebound of other markets that slipped during the recession. Mainframe and minicomputers, which took a drubbing during the downturn, are picking up steam again.

Personal computers for offices continue their rapid growth. Yet despite a favorable business climate, a number of personal computer manufacturers are finding it difficult to remain in business. Osborne Computer Corp., which recently filed for bankruptcy, is but the tip of the iceberg. A number of other companies are struggling. The shakeout that hit the home computer market several months ago is beginning to be felt by those personal computer manufacturers who sell primarily to business. Companies are in trouble, not because total business has fallen off, but because competition has increased, especially from IBM. Not counting the low-end home computers, personal computer sales are expected to grow nearly 60 pct this year.

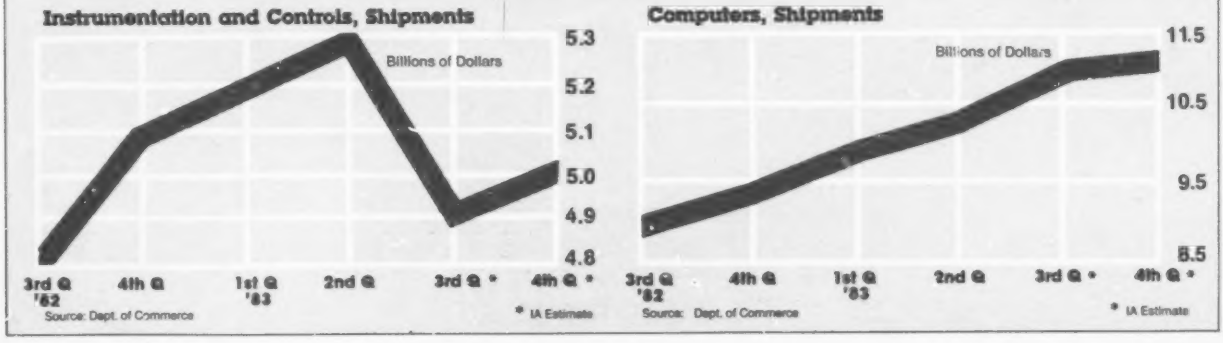
Imports of computers, computer parts and peripherals, especially from Japan, are becoming an increasing concern. Going into the third quarter, imports had topped $1.86 billion dollars, a 84 pct increase over 1982 totals. Japan accounts for about 40 pct of the total value of U.S. imports.

U.S. exports of computers are expected to increase by 20 pct through 1983 as major foreign markets continue their slow recovery. Several firms have reported increasing overseas business in the third quarter and feel the fourth quarter will remain strong.

As the U.S. economy picks up, the computer industry, which overall was never really down, is beginning to approach pre-recession growth rates. "Business looks better and better through the last months of 1983," says one industry member, "but we are still continuing to recover from two years of recession. I think that business will continue to improve through the first half of 1984."

Industry growth is proceeding more rapidly through three quarters than was forecast. And the future looks bright as the run by businessmen on personal computers should continue. Industry is beginning to look to the computer as a major tool for improving productivity and streamlining operations.

The industry's biggest worry is the continuing growth of imports coming into this country.



QUARTERLY FORECAST

Metal Coatings

Shipments of industrial coatings in all of 1983 are expected to increase by 7 pct over those in 1982.

Analysts estimate that 72 million gallons of coatings will be shipped in the third quarter of 1983 and 70 million gallons in the fourth quarter. That's an 8 pct increase over shipments during the second half of 1982.

The two biggest reasons for the upturn in industrial coatings are the auto and appliance industries.

Domestic automakers likely will build 20 pct more cars this year than last. They continue to use increasing amounts of zinc-rich weldable primers such as Zincrometal. Even during the depression in car sales from 1980 to 1982, automakers continued to order more zinc-rich primers and covered more of the car with it.

The 1½-side galvanized steels used by Chrysler sometimes compete with Zincrometal and someday could squeeze out some of its market share. Today, however, shipments of both Zincrometal and 1½-side galvanized steels are increasing.

The appliance industry looks promising especially for coil coaters. General Electric and Whirlpool appear on the verge of a major increase in precoated metals. Other appliance makers likely will follow.

In other major markets for coatings, builders of preengineered structures continue to increase production. Two threats to industrial coatings in this market are bare and galvanized steels; and a law in California that would ban metal-frame residences there. On the bright side, Bethlehem Steel is beginning to precoat Galvalume.

The container industry hasn't been hurt by the recession. In the big battle over how to build beverage containers, precoated steels stand a good chance to be the material of choice for draw and redraw containers.

Plastics

As tough as things have been on the American economy, there is one industry that is flying high—plastics.

Last January, many laughed when G.R. Munger, president of The Society of the Plastics Industry, Inc., predicted a 14 pct increase in the effective use of plastics in 1983.

Well, the way things are shaping up, Mr. Munger might have been too conservative in his estimate. Through the second quarter, 1983 was 13.5 pct ahead of 1982. But business really picked up in June, which was 27 pct ahead of the same period a year ago. From all appearances, the sales and captive use of thermoplastic and thermosetting resins in 1983 will surpass Mr. Munger's prediction.

The second quarter was healthier than the first quarter. The third quarter shows every sign of being an improvement over the second quarter, and the fourth quarter should be the best of all.

So far this year, the big six among the plastics constitute 82 pct of the business. The big six include low-density polyethylene, polyvinyl chloride, high-density polyethylene, polypropylene, polystyrene and the phenolics. Phenolic and other tar acid resins, the only thermoset among the six leading compositions, are showing a huge gain of 22 pct over 1982.

As a whole, thermosetting resins have moved up by 18.7 pct in sales and captive use over 1982. The gain in thermoplastic resins has been 12.8 pct. So far this year, the thermosets have increased their share of the total plastics market from 12.5 to 14 pct.

One explanation given for this good year in plastics is that inventories have been used up and many industries requiring plastics have begun to move full steam ahead. Epoxy resins, a category familiar to metalworking, is showing a 3.3 pct drop, however, in sales and captive use.

Fluid Power

Despite a surprisingly strong order surge in July, as reported by the National Fluid Power Association, (NFPA) fluid power shipments for the last three months of 1983 aren't expected to show much gain over the third quarter level.

Shipments to the mobile power users of hydraulics are still slow, though truck OEM shipments began to advance in the third quarter and are continuing a good performance as the fourth quarter begins.

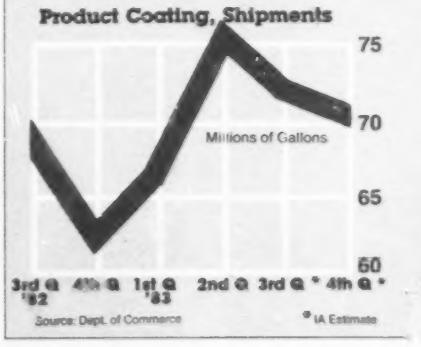
Machine tool and other industrial markets are also continuing slow. Based on orders of small lot sizes and fast deliveries, users of fluid power systems are holding inventories at low levels.

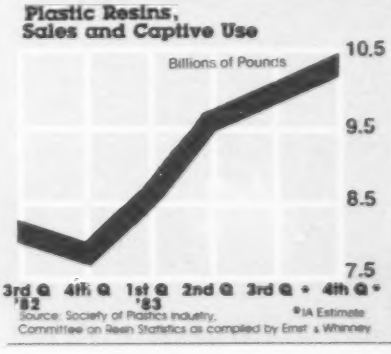
The level of business in the third and fourth quarters looks to be running well over the year ago periods. It is now expected that the shipments of all fluid power items will surpass last year's third and fourth quarters by about 20 pct in each quarter.

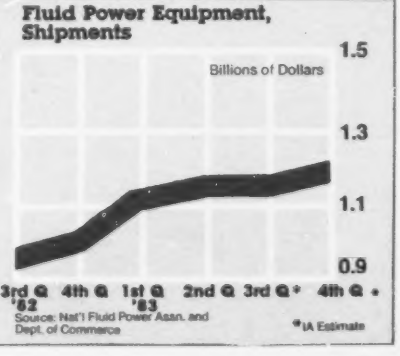
In hydraulics, historically it takes six to nine months for an order surge to be reflected in shipments. In pneumatics, this lag time is considerably shorter. An order surge can increase shipping volume in pneumatics in as little as 30 days.

As a result, a 60 pct gain in new hydraulic orders in July this year, over July 1982 won't be reflected in shipments until the November-December period. Pneumatics, which has been showing a little more stable course in its new orders, rose only 6 pct in July. This should begin to be reflected in rising shipping rates during October.

Fluid power builders are still cautious, but seem to be willing at this stage to agree that 1984 will see another gain over 1983, and that 1983 shipments should show a slight percentage gain over 1982, though only by a few percentage points. All of that gain will come in the second half of 1983.







QUARTERLY FORECAST

Construction

Despite moderate second quarter gains, the construction equipment industry is still weak.

The second calendar quarter is usually the best period of the year for the industry. Traditionally, in the third and the fourth quarter, industry sales drop.

Domestic sales in the second quarter rose 11 pct, but that still left the industry at almost 30 pct under the 1982 sales total.

What has caused more concern in the construction industry ranks was the August comment from Caterpillar Tractor, the industry's largest producer, that it was adjusting its forecast for 1983 downward.

The Caterpillar announcement also included word of some layoffs for September, but other recalls the company plans would give a slight employment gain of about 250 workers.

Export sales of construction equipment amount to about half of total annual sales for many major U.S. builders. So a 50 pct drop in the 1983 first half, after a continuous slide in export sales through 1932, hit the industry hard.

Though some big ticket items like cranes are still heavy in finished goods inventories, stocks of earth moving equipment have finally been reduced to levels described variously as "manageable" to "thin." This could prompt a revival in the industry, perhaps in the current quarter.

To some extent this has already occurred, but it has not been widespread enough to help the entire industry. In some industry segments, like paving machinery, a rebound is in evidence.

With a forecast for next year of moderate gains and dealer inventories looking better, vendors should see some new buying in construction machinery over the next two months, despite any seasonal retail sales decline at the end of the year.

Farm

Despite a summer that was straight out of *The Grapes of Wrath*, farmers will probably take more farm equipment off distributor shelves in the fourth quarter. A mild farm machinery recovery began to be noticed in the first quarter and has continued.

That's a gain, but from a very bad 1982, so the industry still has a long way to go to a recovery. Deere & Co., the biggest U.S. farm machine builder, reported in late August that it was showing a net nine month loss of $34.7 million, despite cutting trade receivables by $157 million and inventory by $231 million in the most recent fiscal quarter.

Despite these plusses, Deere officials warned that there is still a lot of some lines of farm equipment out in inventories.

That takes some of the gloss off the apparent 50 pct retail surge in sales of farm tractors in the second quarter over the low first quarter level. That gain may also look better than it is. For the first time, the Farm & Industrial Equipment Institute began to include small garden type tractor in its statistics in 1983.

In the fourth quarter, sales should rise about 15 pct over the third quarter low.

Low prices were, and continue to be, a depressing factor in the farm equipment picture. Pricing has been soft all through both 1982 and 1983, and there doesn't seem to be much change expected in the fourth quarter.

In May of this year farm equipment builders were polled by the (FIEI) and the results indicated that sales would decline by several percentage points this year. By July, total tractor sales for the year-to-date were only 3.8 pct behind 1982. In the fourth quarter, sales rise seasonally over third quarter. It can be expected that both sales and manufacturing rates will begin to look better in the next two months.

Mining Equipment

The ore boats are moving again on the Great Lakes and an unusually hot summer has kept coal mines busier than usual.

Yet no one in the industry is all smiles. Instead, they hope that one of the worst periods in its history is ending.

Iron mines haven't been as quiet since the Great Depression and it will take a sustained recovery to move this industry towards significant capital investment, says one industry executive. "You may not see another large iron ore project in the U.S. range area for a decade," he adds.

Capacity in northern Michigan and Minnesota was built to handle steel production years of 130 million tons and more. Such years in the U.S. may be gone.

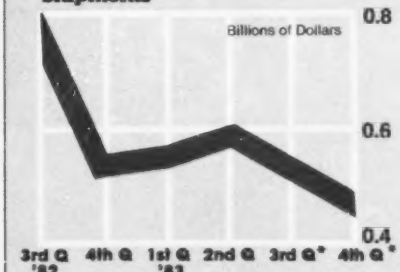
So difficult are the times in iron mining that the unthinkable has occurred in pricing. Some special grades have actually been lowered.

Iron ore price drops are indeed a sign of the times, but not a sign of any increase in industry spending. The special boats, special equipment at the mines and special unloading systems are all in place. The best that iron mining equipment manufacturers can hope for is a slowly recovering customer in need of maintenanace. Even a steel boom would have to last years before any major trend towards further orebody exploitation.

Coal miners, on the other hand, are busy customers for equipment makers. Simply put, coal mining is more essential than ever and analysts expect the industry's tonnage to grow over the next several years at a 10 pct annual rate.

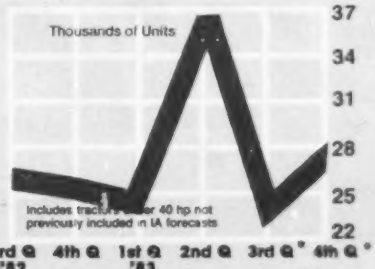
Equipment companies are reporting healthier business from coal interests in over two years and they expect it to continue. "Coal doesn't sound high tech, but without it there isn't any tech," says one analyst.

Construction Equipment, Shipments



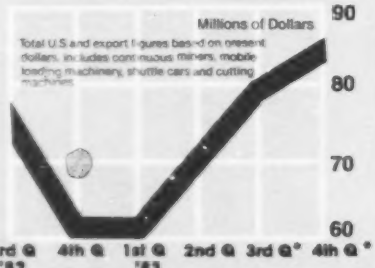
Source: Dept. of Commerce *IA Estimate

Wheeled Tractors, Retail Sales



Source: Farm and Industrial Equipment Institute *IA Estimate

Mining Equipment, Sales



Source: Mining Equipment Mfgrs. *IA Estimate

QUARTERLY FORECAST

Material Handling

"Yes we're seeing it. The recovery is becoming quite real to us," says a leading material handling equipment manufacturer. "Our inquiries are way up, particularly for smaller ticket items like trucks and accessories. That seems to say to us that people are getting busy out there and people are preparing for increased business."

Overall, the industry expects the last half of 1983 to be way above the last half of 1982 by perhaps as much as 20 pct in adjusted figures. And, they happily note, their industry, except for lift trucks, does not suffer from import pressure.

"So much of our industry is custom, almost entirely so in the big-ticket systems end, that we doubt if it will ever have the same import problems as steel or machine tools," says one company president.

Several industry members report a sharp increase in recent weeks in questions about state-of-the-art systems from automotive and aerospace companies. Some expect a traditional increase in capital goods inquiries to follow by the end of 1983.

"We are confident that this country's basic industries are only concerned with appropriate timing and that means perceptions about interest rates long term. When corporate America is convinced of a permanent return to normalcy in that area, coupled with low inflation, our industry's problem will be capacity," says one large firm's chief marketing representative.

The third quarter is already shaping up better by far than the second. Fourth quarter results could be spectacular. And 1984 could very well be a boom year for the industry.

"The market seems to know, in general terms, that we've got a significant product to offer. They only have to believe that the time is right to buy," says one sales executive.

Appliances

With the economy on the upswing, many metalworking industries see good times ahead. The appliance industry is the exception.

The industry has experienced strong sales through the first three quarters of 1983, but is now concerned that some dark clouds may be on the horizon for 1984.

Despite some uncertainties, the industry should stay strong through the fourth quarter of 1983. Fourth quarter shipments will be down slightly from the third quarter figures only because sales normally dip at year end.

The major worry is that rising interest rates will dampen housing starts and sales. New home buyers usually account for about 20 pct of appliance sales.

Following a 3 pct decline in June, July saw home construction down 6 pct. Government officials at that time warned that the housing revival could continue to weaken.

However, in August new housing starts jumped by 8.4 pct, the highest level in more than four years. While the higher mortgages seem not to be affecting housing starts at present, August witnessed a 6 pct drop in building permits, which could signal some disinterest by the builders.

Despite recent increases in mortgage rates and any slump in housing permits or starts in the fourth quarter, appliances should sell strongly through 1983.

If the growth of appliance sales to home owners is expected to ease next year, retail sales are expected to remain strong. A pent up demand for replacement appliances shows little sign of abating. Retail sales this year have been greater than last year.

The number of appliances sold during the first half of 1983 was up 8 pct from 1982. Sales for all of 1983 compared to 1982 should show an increase of 12 pct.

Oil Country

The pace of oil drilling activity has been slowly increasing, lending an air of cautious optimism to the producers of oil country tubular goods (OCTG).

But the ascent is expected to be gradual, and there is little indication that OCTG producers are anticipating any strong recovery this year that would return shipments to the levels of two years ago, before the current dramatic downturn began.

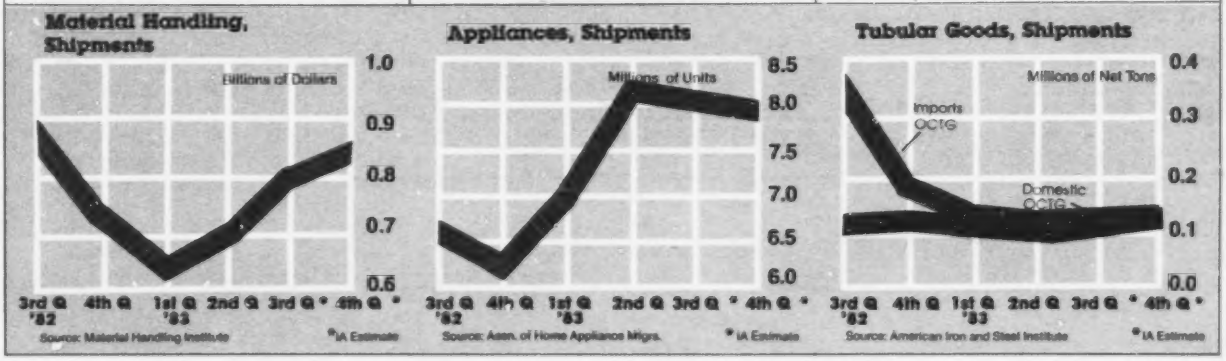
Rig activity has been on a steady increase since bottoming out in mid-April. By mid-September, there were 2,247 rigs operating, up some 24 pct from the 1,807 low point in April, but still below last year's comparable rig count of 2,499.

The rebound in the national economy and a firming in energy prices are cited as key factors in the noted upsurge. Uncertainty surrounding the latest price points established by OPEC appears to have been removed after a delay of several weeks while industry officials waited to see if the new price levels would hold.

Another contributing factor, in the view of industry analysts, is that several large oil companies underspent their drilling budgets during the first half of the year and now are compensating in the second half. Drilling expenditures have risen about 12 pct.

But the focus remains on oil rather than deep gas. Costly offshore drilling, which requires new expenditures, will, in the industry's view, recover slowly. Officials don't foresee any dramatic upturn until at least 1985.

And for OCTG officials, extreme caution remains the rule, because there is as much as a two-year supply of tubular goods and other oilfield hardware on hand. There has been a surplus of inventory at almost every level. Some officials don't believe the needed recovery will come until the rig utilization rate reaches 70 pct, a significant rise from the current pace.



QUARTERLY FORECAST

Castings

Ferrous castings should show some seasonal dip in the fourth quarter. Historically, industry shipments in the third quarter drop about 7.5 pct below the second quarter level.

But this year, that isn't what's happening. Though plagued by high scrap prices, short backlogs and critically short delivery times from their customers, a wide segment of foundries have been getting some unseasonal gains in orders—even during the summer months.

Although the gains were minimal and masked by the relatively low order lots from customers, the incoming order frequency rate began to advance in areas of truck, appliance, and farm and construction machinery.

That hasn't cured the very competitive price problem in castings. However, heavy castings buyers are beginning to stir a little and get ready for heavier buying in the fourth quarter. Since the consumer markets for castings (auto and appliance) tend to drop off at that time, the gains from industrial market buyers aren't going to be enough to push total castings shipments up to the level of the second quarter.

But it does mean that a segment of the foundry industry that has been running at 40 pct and 50 pct of capacity in recent months is beginning to get out of the basement.

It also means that castings shipments in the ferrous grades are going to squeeze past their low 1982 total performance when the final figures are totaled up for 1983.

This isn't yet evident in the order backlog, mainly because of the very short delivery times customers insist on getting.

But there have been very mild backlog gains over the third quarter. It now appears that these gains will continue, at least in the heavier castings, through the fourth quarter.

Forgings

After a long drought, the forging industry is beginning its turnaround.

A pickup in orders has finally come, although the gains so far have been confined to impression die forgings and some ring-rolled forgings. Open die producers remain in bad shape.

In April, impression die forging orders were about the same as those received in the same period a year earlier. Since April, however, monthly orders have been well above their 1982 counterparts. For example: In July, traditionally a slow month for the industry, orders reached $132.3 million compared to $87 million in July 1982.

Though the industry has begun to bounce back, it still has a long way to go to regain its health.

The industry's 1982 sales fell 45 pct below 1981 figures and so far this year orders are running only about 12 pct above 1982 totals.

Since 40 pct of forging sales go to aerospace industries, recent order increases from that market have provided some reasons for optimism. While commercial aircraft manufacturers are not building many planes, increased parts orders are coming in from military aircraft manufacturers.

The automotive industry is also demanding more forgings, although that industry accounts for only a small percentage (5 pct) of the total market for impression die forgings.

Other industries, such as farm and construction equipment and oil field goods, remain depressed, however.

Even firms that are seeing new orders this quarter, don't see a great deal more this year.

"We see ourselves on a plateau for the rest of the year, but at least that plateau is a little higher than earlier this year," explains one executive.

Many industry members are optimistic about 1984, but anticipate that growth throughout the year will be gradual.

Heat Treating

The range of reports on business conditions from heat treaters still varies and really depends on who you talk to.

One of the remarkably strong areas is automotive. While the general heat treating industry has been below the year ago period in the first half, some producers with a strong consumer auto customer list, have been beating their 1982 performance all the way through the first half of 1983. They argue, and with good cause, that they will continue to run at this strong rate right through the remainder of 1983 and into next year.

On the basis of past history, the industry traditionally has its strongest gains in the first half, and then, slumps about 10 pct (below the second quarter) during the third quarter. Some heat treaters went through the summer months at second quarter levels. One company was running substantially over the third quarter of this year—even though it improved upon its performance in both the second and third quarters of 1982.

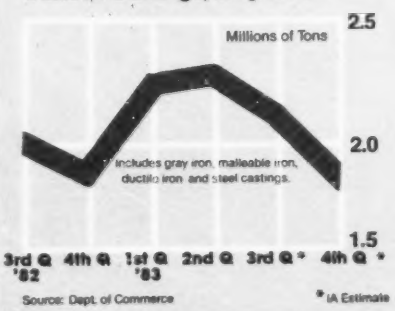
Even more surprising, some heat treaters who market heavily in the capital goods markets have done well. One industry member admitted a 20 pct improvement over last year's third quarter.

He believes that margin can be improved to 30 pct over year ago levels in the fourth quarter.

Traditionally, the industry posts its best gains in the first and second quarters of the year. The data suggests that the second quarter automotive surge improved on what would have been just an average period.

This surge should also improve on the prospects for a good second half, despite complaints by many heat treaters that cash is still tight. A more normal surge in the fourth quarter heat treating business will help confirm expected gains for the industry again next year.

Ferrous Castings, Shipments



Source: Dept. of Commerce * IA Estimate

Closed Impression Die Forgings, Shipments

Source: Forging Industry Assn. * IA Estimate

Heat Treatment

Source: Industrial Heating Equipment Assn. and Metal Treating Institute * IA Estimate

QUARTERLY FORECAST

Aircraft

The outlook for aircraft manufacturers is brightening.

Although shipments are showing an improvement over last year's severely depressed levels, there is still little indication of an across-the-board, sustained recovery.

There is subdued optimism, based on reports from major airline carriers, the customer base for the manufacturers. Air traffic has been building at the major domestic carriers this year and the second quarter figures were strong enough to restore a positive earnings picture for most domestic carriers for the first time in a year.

If this trend continues for the duration of the crucial third quarter and into the fourth, the airlines could be ready within six to nine months to begin placing the orders for the new aircraft that the manufacturers confidently are waiting to sell.

Meanwhile, the aircraft manufacturing sector continues to be burdened with fierce competition, novel leasing arrangements and a glut of used aircraft, all of which depress new sales.

One leading American aircraft executive echoes a common sentiment when he notes that although airline traffic growth and recent profiles have shown some improvement, the world's airlines still are faced with a cost/revenue squeeze and considerable excess capacity in certain models of aircraft.

As a result, new order activity continues to be low for all manufacturers, some deliveries are being deferred and, in certain cases, manufacturers are being required to make substantial financing commitments to sell the new planes.

However, although the short-term market remains uncertain, optimism prevails about the long-term outlook. Major manufacturers are positioned to respond to the expected resurgence of demand with new technology and more fuel efficient aircraft.

Engines & Turbines

The engines and turbines industry continues to lag in the second half, with certain segments of the wide-ranging category showing some improvement and others noticing little increase in demand.

Any upswings noted have been minimal. So while the signs are more hopeful over the long-term, the short-term outlook remains guarded.

The consensus leans toward a relatively flat demand curve through the remainder of the year. No strong upsurge is anticipated until at least midway through 1984.

One major problem affecting the industry is the caution surrounding interest rates and the strength of the national economic recovery. The building industry is showing only a half-hearted recovery, and as a result, construction equipment producers suffer from an inventory excess and continued uncertainty.

The lingering recession in the commercial aircraft market also is taking its toll in the engine sector. Few industry executives forsee a recovery until the middle of 1984.

The power generation market continues in a weakened state, so the outlook for power generation sets remains flat. One official says the recovery in this segment is lagging about 18 months behind that of the general economy.

The utilities market slump is dragging down that segment of the engine and turbine industry. With no new major projects in the nuclear field planned, the outlook for equipment suppliers is dim.

One hopeful sign is a firming up of crude oil prices, which is having a positive impact on the refinery business. On the whole, most industry observers look for slight increases through the end of the year with no strong movement toward recovery until the middle of 1984 at the earliest.

Welding

The welding industry experienced a sudden, unexpected upsurge in business during the second quarter, but, looking back, the spurt has to be regarded as a false alarm.

Business for the welding industry has returned to the course it has been following since the second quarter of 1982: Just plain flat.

According to the statistics compiled by the National Welding Supply Association (NWSA), Philadelphia, June was the best month for welding distributors since November 1981, and 1981 was the best year in the welding industry's history.

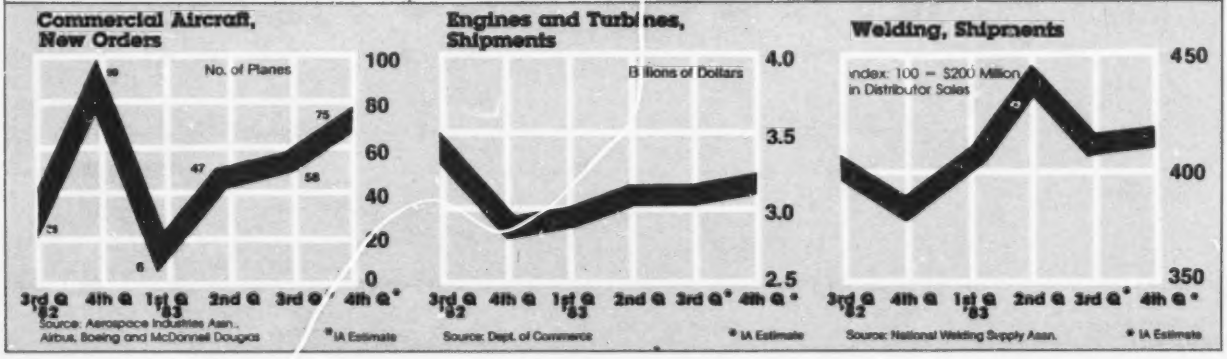
This year's third quarter resembled the first quarter, and the fourth quarter will probably be about the same. If there is anything good to look forward to, it could be the first quarter of 1984. That could be the time when industry will have no other choice than to replenish inventories.

Several distributors throughout the country have given their views on the present state of the welding economy. One remarked: "Last year we were in the absolute pits at this time. Welding lags the rest of the country by six months; therefore, we are hoping for a strong 1984."

Major deterrents to recovery in the Midwest, a big market area for welding, include lackluster activity in machine-related businesses, automobile supply parts, and heavy equipment, both agricultural and off-road types.

"This is not an area where industries are taking off and we don't expect much for the rest of the year," observes a welding distributor from the Midwest.

"We see sporadic signs of recovery," comments a distributor from the Northeast. "We experienced a boost in May and June, but things fell apart in July. We are not seeing fewer customers, but we are seeing fewer orders."



QUARTERLY FORECAST

Fasteners

Mechanical fastener manufacturers are reporting some surprisingly good business signs as the industry heads into the fourth quarter.

"We're seeing increases across the board," says one large fastener manufacturer. "It's really surprising."

Imports, however, continue to plague this industry. There seems to be no real hope of any relief, says one industrial analyst, unless some "totally new industrial policy develops in the U.S."

Still, it has been nearly two years since any good news arrived for the fastener manufacturers and expectations are that dollar volume will be up by as much as 15 pct in the third quarter compared to 1982 and as much as 20 pct in the fourth quarter. "That's up from a bottom, of course," says the industry analyst.

If 1984 is "surprisingly better" than the markedly improved last half of 1983, fastener makers believe there may be a future for what remains of the standards part of the domestic industry. This assumes reductions in imports as well as increases in sales here due to a worldwide recovery and strained overall capacity.

"The terrific increases in automotive has helped us a lot," says one manufacturer. "From what we hear, that trend will continue. I guess people have decided to buy new cars again."

Some producers also expect a traditional follow through, with the rest of the economy picking up steam as the year ends. "We expect exactly that," says the manufacturer. "We see a very, very good last quarter for parts of this industry."

The "parts" he is referring to are so-called specials or engineered fasteners. Standard nut, bolt and screw companies can only report a continuing erosion of the market to the Pacific Basin economies.

Screw Machine Products

Although the worse is over, screw machine product manufacturers remain cautiously optimistic about continuing industry growth.

Through three-quarters of 1983, the industry has seen a modest, but spotty upturn from 1982. A number of manufacturers see further recovery as a slow, uneven process.

Sales are beginning to pickup as the economy thaws. Through July year-to-date orders are running about 26 pct ahead of last year. U.S. Commerce Department officials believe industry shipments for the year will be a bit above 1982 totals. Industry experts see order gains for the year holding up through the fourth quarter and building steadily in 1984.

The best thing to happen to the industry has been the pickup of automotive sales, since about one-third of all screw machine products go into cars and automotive-related equipment.

"Our automotive business picked up in April and has seen some growth since then, although business still could be better," says one manufacturer. "I see 1984 being a better year than 1983, but growth is going to be slow."

Another bright spot has been the strong showing throughout 1983 of the appliance industry. Sales to electronics firms and computer manufacturers have risen as have orders from firms making equipment for the military.

Those markets that remain depressed include the aircraft, general machinery, oil field products and off-highway equipment manufacturers.

This industry is tied to the general economy. The faster this country pulls itself out the the recession, the better the screw machine products industry will fare. But the industry will not experience strong sustained growth as long as a number of sectors remain depressed.

Stampings

With the acceleration in auto sales, continued improvement in consumer spending patterns, robust activity in the computer field and some recent large defense contracts, the stamping industry expects to finish the fourth quarter from 5 to 10 pct ahead of that period in 1982.

But make no mistake about it, says one executive,"we're talking cautious optimism, not jubilation."

The industry backlog in July stood at its highest point since May 1981. The strength of the backlog, reflected by the scheduling of future shipments, will probably "be good from here on out," says another stamping source.

Orders and shipments of contract metal stampings showed the usual seasonal slump in July, yet were 51 pct higher than July 1982 figures.

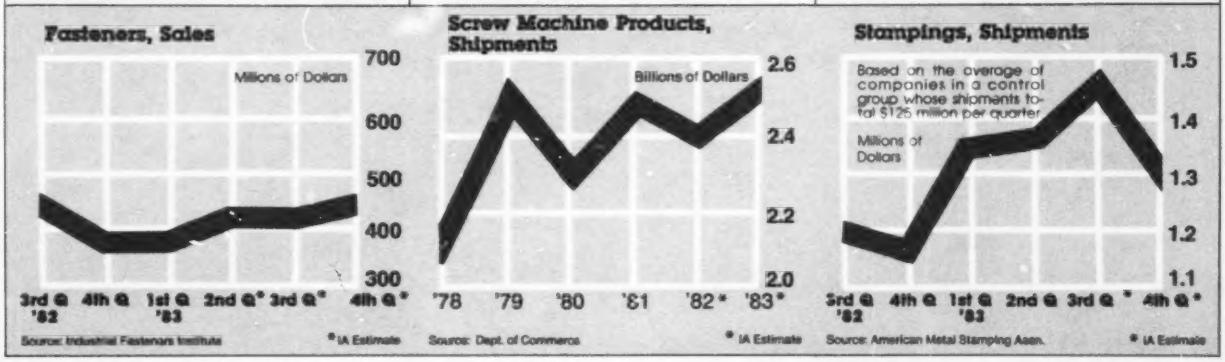
Stampers are elated about the rebound in domestic auto demand, since that market constitutes half of their total market. Imports don't heavily impact this industry, although as one stamping executive puts it, each finished car that comes into this country costs the industry 100 stampings.

The appliance market is holding up well for the stamping industry. According to one stamping industry executive, consumers are continuing to purchase refrigerators, washing machines, dryers and stoves. Of course, this summer's unrelenting heat wave really heated up sales of air conditioning equipment.

How do stampers see the economy in 1984?

Notes one executive: "It behooves the Reagan Administration to appear to be effecting a healthy, active economy. So I'm predicting that there will be a crimping of interest rates and inflation will resume somewhat as more money becomes available.

"I envision arbitrary controls going into place, too, as a short-term spur to the economy."



QUARTERLY FORECAST

Bearings

Despite the pickup in the general economy, the bearing industry is still struggling.

Figures for the first half of the year show business for the bearing industry down about 15 pct. And although bearing manufacturers see some turnaround by the end of the year, 1983 will stack up as a mediocre year.

That the recession continues to plague this industry is surprising. Some 30 pct of bearing sales go to the automotive industry, which is enjoying increased business.

The growth in orders from the automotive industry has not been able to offset the continuing depression of other major markets.

"A number of industries are still hurting," reports one industry spokesman. "Farm machinery is way off, construction machinery is still down and oil field goods took a significant dip this year. That industry is looking at about a 25 pct decline this year."

In addition, despite some pickup in military spending, the aircraft industry is doing worse than last year. Other bearings markets still in the doldrums include the metalworking machinery industry, railroad equipment and industrial machinery.

Too much dead weight is pulling down any gains the industry has made. Thus, despite an expected business pickup during the next several months, U.S. Commerce Department officials predict that bearing shipments by the end of the year will be down 7-8 pct from 1982.

The best that can be said is that current declines are not as bad as 1982. Shipments that year dropped almost 20 pct. The poor showing has made analysts hesitant to predict a strong 1984.

However, as the economy continues to heat up, manufacturers are optimistic that the bearing industry will eventually start rolling.

Valves

Overall, valve manufacturers seem to characterize their industry as "somewhat better" than it has been lately. Several believe a gradual recovery will take place in the last quarter.

But one industry spokesman says this is a time of turmoil for his business. He sees the continuing competition as either forcing some businesses to scale down or withdraw entirely.

"There's nothing like it since 1958," he concludes.

His lead times are running three to four weeks, compared with 10 to 12 weeks in the same period of 1982.

Operating rates in the industry are still down, notes another valve industry source, but are expected to rise slightly in the fourth quarter.

He rates present construction activity as 'so-so'.

The municipal market was on the upswing in the third quarter of this year, as a result of a decline in interest rates. One industry member says the market for water and sewage equipment turned around.

The energy market was described as "flat on its back" in the previous quarter. But now, says one valve official, there's been a resumption in drilling. Since some 50 to 60 pct of valves are used by the energy field, this is good news to the valve industry.

However, as one valve spokesman points out, the energy companies are in the buying seat and making the most of it—they are heavily into price negotiating and they don't carry inventories.

One industry source admits his shipments for the last quarter will trail those of 1982, but he is boosting inventories 10 to 15 pct to catch the demand for fast deliveries.

Despite the hard times, valve executives are looking at it philosophically. As one put it, "we may be better off in the long run for this, it will have forced us to be more efficient."

Gears

Although one gear executive sees the final quarter of 1984 closing on a "moderately optimistic" note, most believe that no improvement will be evident until the second, perhaps the third, quarter of 1984.

Meanwhile, there's lots of bidding going on, with everyone jumping for all available jobs. Lead times, says one executive, are ridiculously short.

"Everyone wants it yesterday," grumbled one gear maker.

The auto industry is a captive shop for the gear business, so gear executives couldn't be happier that domestic car sales are doing so well.

Defense and aerospace business has been soaring lately, but that accounts for a small segment of the industry's orders.

Gear industry executives differ in their perceptions of farm equipment purchases. Because of the prolonged drought and poor crop yield, says one executive, farmers can't be in an equipment-buying mood. Another calls this a bullish market, buoyed by the Soviet grain deal and PIK (Payment-In-Kind). Farmers have money and will be spending it for new machinery. He sees new orders from the farm equipment manufactuers coming in by October.

What is bothering gear manufacturers?

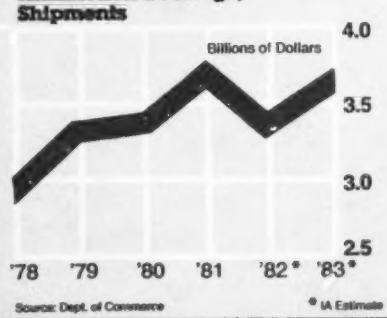
Most cite Federal deficit spending and higher interest rates, which depress their orders from capital goods producers.

The strong dollar continues to encourage gear imports, with exports running low. But until interest rates decline, gear makers don't see any reversal of this lopsided condition.

Even with little to write home about, gear manufacturers are expressing confidence in the future.

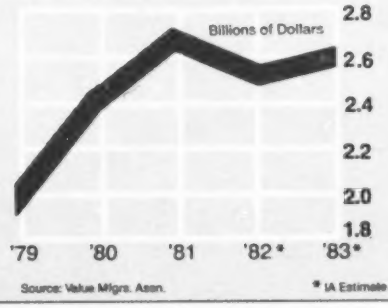
But, of their own last quarter, 1983, says one, "we're just bumping along the bottom."

Antifriction Bearings, Shipments



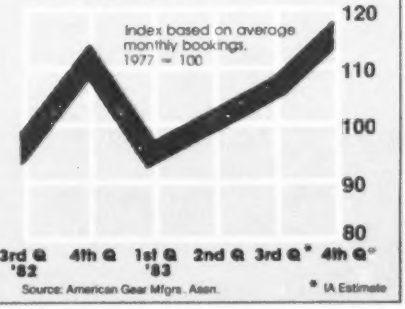
Source: Dept. of Commerce * IA Estimate

Valves, Shipments



Source: Valve Mfgrs. Assn. * IA Estimate

Gears, Bookings



Source: American Gear Mfgrs. Assn. * IA Estimate

QUARTERLY FORECAST

Shipbuilding

An oversupply of merchant vessels, few new orders and a nearly nonexistent order backlog continue to plague the shipbuilding industry.

According to one observer, foreign shipbuilders have captured a large share of the merchant vessel market with government-subsidized prices and modern facilities.

"Unless the battle against (the Reagan) Administration free trade advocates is won," he says, "and some favorable legislation is passed, domestic commercial shipbuilding capacity will continue to erode."

Commercial business is so bad that the only significant new construction is a coal barge for the Delaware Bay.

A battle is shaping up in Congress over the 1920 Jones Act, which has continuously required that only U.S.-flag, U.S.-built and U.S.-manned vessels may operate in domestic trade.

Appropriations for FY 1984's Navy Shipbuilding and Conversion program will probably run slightly over $12 billion. This expenditure calls for the construction of 16 ships. Leading the agenda are three Aegis cruisers, three attack submarines, one Trident submarine and an amphibious assault ship. Also to be constructed are a landing dock, two fleet oilers, three mine countermeasures ships, a guided-missile frigate and a mine hunter.

On the conversion side, work is planned for four fast logistics ships and one hospital ship.

Only four to five shipyards will participate in this construction work.

In FY 1983, the Navy appropriation was $20.6 billion. Included in that program, however, were two aircraft carriers. The year before, the expenditure was $12.8 billion.

What effect, if any, will the Korean Air Lines incident will have over Navy shipbuilding? It's too early to say for sure.

Rail Cars

As goes coal, so goes rail car construction, and coal has not been moving well lately. Truck trailers and grain are other major factors in determining the health of the railroads, but coal is the big one.

According to the Association of American Railroads (AAR) and the American Railway Car Institute, orders for new freight cars totaled 934 in July, up from 150 in June and 179 in July 1982. Orders through the first seven months of 1983 totaled 3,564, compared with 4,844 for the same period a year ago.

Deliveries in July totaled 289, compared with 338 in June and 1,381 in July of last year. The seven-month total was 2,593, compared with a whopping 13,769 during the same time frame in 1982.

The two railroad associations report that the backlog of cars on order but undelivered as of Aug. 1 was 3,968, compared with 4,659 on July 1 and 7,285 on Aug. 1, 1982. So far in 1983, the average monthly backlog is 4,310 cars, compared with 11,305 last year.

Meanwhile, the AAR reports that 11 new and rebuilt locomotives were placed in service in July, compared with 13 in June and 16 in July 1982.

Taking retirements into account, the fleet of owned and leased diesel locomotives on Aug. 1 totaled 26,249, compared with 26,290 on July 1, and 27,397 on Aug. 1, 1982.

According to the AAR, net revenue from operations for the U.S. freight railroad industry in the second quarter of 1983 totalled $349.4 million, 12.6 pct below the 1982 second quarter figure of $399.8 million. □

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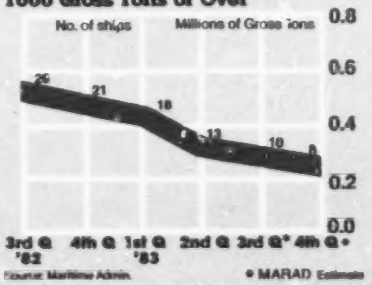
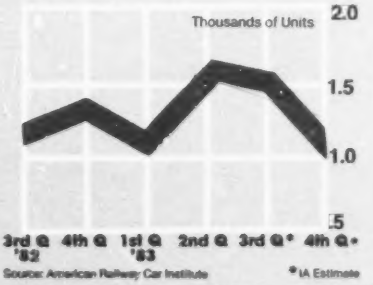
Shipbuilding, Commercial Ships on Order or Under Construction, 1000 Gross Tons or Over



Source: Maritime Admin. * MARAD Estimate

Rail Car, Orders



Source: American Railway Car Institute * IA Estimate

High blood pressure. Treat it and live.

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High blood pressure. Treat it every day and live.

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National Heart, Lung, and Blood Institute
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STEEL TAKES AN ORGANIZED LOOK AT QUALITY

Steel is under heavy pressure to improve quality and lower costs and it believes it can do it through the use of process control.

BY GEORGE J. MCMANUS

"From my viewpoint, it's the biggest thing that's happened in my 20 years with the company," says Herman J. Henn, staff engineer, control engineeering in the research department of Jones & Laughlin Steel Corp.

Mr. Henn refers to a control network that centers on a new continuous caster at J&L's Indiana Harbor Works.

From another viewpoint, the control field is discussed by Robert E. Maroney, president, metallurgical products, Leeds & Northrup Co.

"As suppliers we're encouraged by the steel industry's new commitment to process control," says Mr. Maroney. "We're coming to the conclusion that this may be a bigger market than we thought."

Also bullish is IBM, which is re-entering the market for process computers in steel and all manufacturing. "We are targeting industrial automation as a major growth area," says Holland Brown, manager of IBM's industrial automation center in Houston.

In the steel industry, companies are under heavy pressure to improve quaiity and lower costs. The mills don't have the money to do this by building complete new blast furnaces and strip mills. Existing facilities must be upgraded and control systems provide the means of doing this without massive infusions of cash.

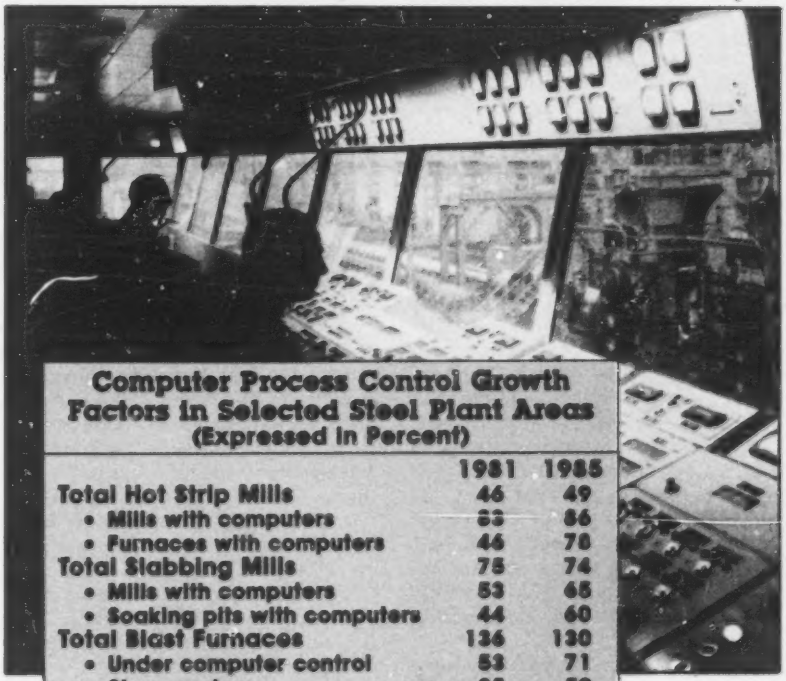
"I look at it as one of the few areas where it's possible to make significant improvements in quality and productivity without large capital investments," says Ronald Miner, manager of process systems in research at Republic Steel Corp. Republic is completing the installation of second generation computer systems in the company's basic oxygen shops.

As these comments suggest, the steel industry has quietly launched a drive to sharpen and extend process control systems. There are two broad trends. First, mini-computers and related devices are being used for direct local control of processes. Secondly, centralized, hierarchial systems are being used to coordinate different processes and supervise whole plants.

In part, this activity stems from advances in hardware technology. Minicomputers, micro-processors, and programmable controllers are making it practical and desirable to distribute the direct control of processes.

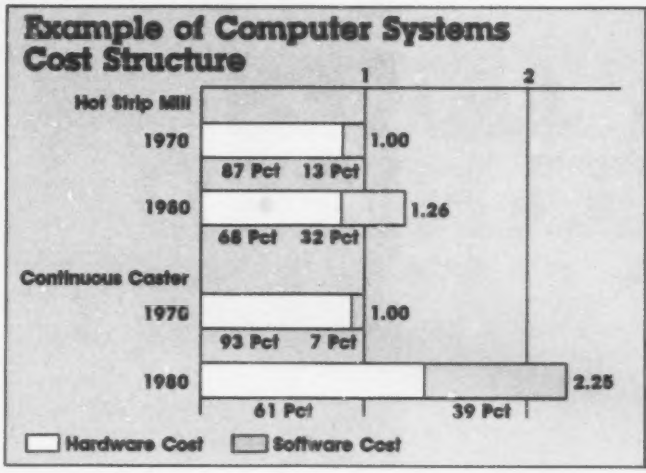
In addition, there is now the software for hierarchial systems. In the few large projects that are underway, multi-level networks are being installed in one swoop. Sophisticated control systems are considered a must for the big continuous casters now going in.

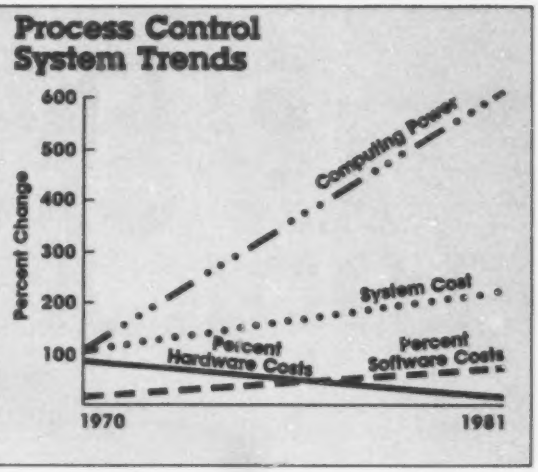
A unique aspect of the control program is that it involves a high degree of industrywide cooperation. There has been broad participation in the hierarchial system work of Theodore J. Williams, professor of engineering and director of the Purdue Laboratory for



Computer Process Control Growth Factors in Selected Steel Plant Areas
(Expressed in Percent)

	1981	1985
Total Hot Strip Mills	46	49
• Mills with computers	83	86
• Furnaces with computers	46	78
Total Slabbing Mills	75	74
• Mills with computers	53	65
• Soaking pits with computers	44	60
Total Blast Furnaces	136	130
• Under computer control	53	71
• Stove systems	35	59
Total Coke Batteries	150	144
• Under computer control	12	22





Applied Industrial Control.

"Over the past ten-year period," says Dr. Williams, "the North American steel industry, both U.S. and Canadian, has been carrying out a major cooperative study of overall hierarchial computer control systems..."

The American Iron & Steel Institute (AISI) is working with steel companies and government agencies to develop better sensing devices.

"The big hang-up in the past was that we didn't have the proper sensors," says Leonard E. Malin, general manager of process engineering for United States Steel Corp. The need for further instrument development is generally recognized.

"We seem to be at the point where the software has caught up with the sensors," says Mr. Maroney of Leeds & Northrup.

Most interesting, perhaps, is the planned industry approach to computerization. A task force of the Association of Iron & Steel Engineers (AISE) is working to make software portable. One aim is to make systems that are installed on a piecemeal basis compatable with the networks that will eventually be built. Another big goal is to avoid duplication of effort at different companies by making the software developed at one company interchangeable with the systems of others.

All of which is providing a body of technology for improved control of steel processes. As has been indicated, the improvement is needed partly to meet tight quality requirements. The auto companies, among others, are demanding that the mills provide high quality and that they document their quality control.

"They're requesting each supplier to show evidence that they're doing statistical process control," says Joseph Tuttle, industrial engineer at the Middletown Works of Armco Inc.

All the big mills are pushing statistical control. People are taking "an organized look at quality," says Donald Shiflett, general manger of management services for National Steel Corp. Jones & Laughlin has established an Integrated Quality Control System. Others have their own names.

The need to capture quality data is one of the reasons for computerization. "What the Japanese have done and what we would like to have is quality tracking," says Mr. Malin of U.S. Steel. At the Kimitsu Works of Nippon Steel Corp., they will record something like 5,000 process variables and hold that data for a year after the product is shipped.

At this stage of its statistical program, Armco feels broad, fundamental understanding is more important than high-powered electronics.

"We've trained about 400 people, now," says Mr. Tuttle. "They'll be training their turn foremen in the basics of statistical process control. We're avoiding the use of computers until these people applying statistical control understand the whole process."

Using simple charts and calculators, says Mr. Tuttle, people can get a grasp of process causes and effects. This approach has had significant impact in stabilizing operations. On an Armco hot strip mill, diversions were reduced from 20 to 25 a week to one to three.

Once the statistical concept has been ingrained, says Mr. Tuttle, more elaborate analysis can be employed. "There's a wealth of information we're capturing on process control computers."

Closely related to quality is the aim of efficiency through better control. There is great potential in their area for the simple reason that today's hardware is a lot better than what was available only a few years ago.

"Our BOF shops have been computerized for a long time," says Mr. Miner of Republic. "The systems that were in place were aging. We were able to make significant improvements in capacity and flexibility."

National Steel is going through a similar program of updating BOF controls. "We are substantially increasing the precision of the BOF control," says James N. Howell, engineering vice president for National. Improved yield and fewer reblows are among the benefits cited.

"Reliability and flexibility are improving," says Mr. Shiflett of National. "The cost performance is more attractive."

In a typical older system, a computer would calculate oxygen flow rates, lance heights and other variables. An operator would then use this information to turn valves and run drive systems.

In the distributed control system at J&L's Indiana Harbor plant, these physical acts are performed by a programmable control on instructions from the process computer. "The controller governs the oxygen blow period, automatically adjusts lance height, and changes the oxygen flow rates," says Mr. Henn of J&L.

In a growing number of cases, it's impossible to operate efficiently without a computerized control. Republic found this out when it installed a rotating top on a blast furnace at Warren, Ohio. The new method of burden distribution initially produced excessive lining wear.

The company had captured enough data to make an analysis. "We have a computer control system with the basic function of monitoring," says Mr. Miner. By sifting the data and adding some sensing devices, Republic was able to devise a distribution pattern that gave good lining life.

The continuous heat treating line being started at Bethlehem's Burns Harbor is being asked to anneal soft sheet and harden high strength sheet. "To

gain the productivity, the computer will be necessary," says James A. Barsic, supervisor of control systems at Burns Harbor. Mr. Barsic suspects that quality as well as efficiency would suffer without a computer.

The progress of control concepts is brought out by the advances made on a slabbing mill at Inland Steel. When the mill was installed in the Fifties, it was equipped with a punched card system of control. "They had a card for every ingot-slab combination," says Randy Pals of Inland. "They would put this card into a hard wire system."

This approach was very cumbersome and inflexible. Operators would often ignore the preplanned schedule because the steel was hotter or colder than it was supposed to be.

In March of 1981, Inland replaced the punched cards with a small computer. This got away from the awkwardness of handling a lot of cards but it still operated on a pre-planned pass schedule. Like the original system, the computer had the disadvantage of inflexibility.

In June of 1982, Inland went to a true computer control on the slabber. Rather than fixed schedules, the computer worked from a model and devised the optimum sequences for particular ingots and slabs. There was provision for the input of hardness variations due to temperature or composition.

In October of 1982, a further modification was the installation of a torque monitoring computer. "It gives us immediate feedback on how much work we're putting into the steel," says Mr. Pals. Still later last year, Inland made position regulation an internal function of the computer.

"This is very typical of the things we do," says Mr. Pals. "We've done a very similar kind of job on our 12-in. bar mill."

Inland's bar mill program is typical of how existing facilities are being upgraded throughout the industry. The potential in this regard was brought out when Chaparral Steel Co. modernized the drive and control system of a bar mill built in 1975.

Thyristor convertors were installed on all the main drives by ASEA Industrial Systems, Inc. These provided faster response and more accurate speed control. Overriding control was provided by a micro-computer based digital system. Apart from this, there were only minor modifications of the existing mills.

The impact of the changes were dramatic. "The payback time at Chaparral Steel was three or four months," says Ake Nilsson, section manager for ASEA.

The modernization was completed with a minimum of downtime. The control system was installed in 1982 between Christmas and New Year's. "The mill started up January 3rd with full production the first day," says Mr. Nilsson. "There was a total downtime of 10 hours during the first week for fine tuning."

ASEA has made 20 similar installations throughout the world. The company's system will go on the new mill of Talley Metals Technology in South Carolina.

" A number of tandem mills around the country need some kind of upgrading to be able to compete with imports," says Mr. Nilsson.

As has been indicated, much of the process control work is on a piecemeal basis. Dr. Williams of Purdue estimates it would cost around $100 million to install complete hierarchial systems on an integrated steel plant.

Even if money were availabie, it takes considerable time and brainpower to fully computerize a complete steel mill. Nippon Steel's quality tracking system gives some idea of what's involved.

"At Kimitsu, they told us it took three years to plan that system and 10 years to implement it," says William A. Kolb, senior applications engineer, U.S. Steel.

Nevertheless, there is work on computer networks that span more than one process. At Middletown, Armco has built up a broad control system.

"Most of our major operations were either retrofitted or originally had process control computers," says Mr. Tuttle. "They talk to each other by a coaxial cable. There are 10 miles of it running around the plant.

"They talk to the operations research system where we do models and simulations. They also communicate with our corporation communications center."

Armco feels it has been in the forefront of new computer technology. "One of the things we did was coin the phrase, ingot processing, when we were putting in our hierarchy here at Middletown Works," says Mr. Tuttle.

A Greenfield steel plant is being built by Timken Co. At Fairfield, Ala., U.S. Steel is installing a new caster and a complete seamless complex. It goes without saying that extensive computer control will be used in operations of this magnitude.

The Fairfield program provides a good view of the new control concept. Direct control of processes is distributed to separate local systems. "You need three basic types of first level control," says Mr. Kolb.

First, there is the instrumentation. Then, there are the controllers which move valves, rolls and other physical components. Finally, there are the programmable logic controls. These do the sequencing—the starting and stopping of conveyors and drives.

At this first level, various terms are used for microcomputers dedicated to different functions. "It's a little microprocessor on a chip," says Mr. Kolb. "The instrument people would take that chip and put it in a Leeds & Northrup or a Foxboro system. General Electric would take the same chip and put it in a drive controller."

At the direct control level, the microcomputer is characterized by high speed and relatively narrow functional ranges. "It's limited in its capacity to store data," says Mr. Kolb. "It's geared toward real time. You're talking milliseconds."

Various advantages are cited from distributed control. Compared to the earlier systems, it offers greater flexibility. "If you have a hard wire gage control, you have to go out and switch wires around," says Mr. Kolb. "If you have a computer, you just change a couple of consonants in the software and you run the strip mill a different way."

Localized controls are seen simplifying repairs. "You don't have to go in the big box and find out what's wrong," says Mr. Kolb. In start-up situations, individual control systems can be worked on at the same time.

Above the direct controls in U.S. Steel's scheme are level two minicomputers. These provide set-up information to the control systems. They track material through the process. Speed is less critical at this level of the hierarchy.

At Fairfield, U.S. Steel will have a level two computer for the bloom furnace. Another will handle the piercer and elongator. There are additional units for the mandrel mill, the stretch reducer, the heat treating, finishing and storage operations.

"It's like a foreman in every one of the areas," says Mr. Kolb. "Under the direction of them are the level one micro-computers which do the work."

The next step up is overall control of the pipe mill. "We have a level three computer which would be like the division superintendent," says Mr. Kolb. "It's basic function is to bring all tracking information together so it knows where everything is."

Ultimately, the level three computer will be pacing the operation, synchronizing the different steps. Beyond that, the pipe mill computer will be linked with the steelmaking and casting computers. The whole plant will move to the same beat.

Finally, the plant process control will

interface with the business computer. "We would consider that the fourth level," says Mr. Kolb. "The business computer gets all the orders and sets all the production schedules." Quality tracking and various types of analysis will be handled at level four.

All this describes the ideal system men are working toward. "Here is the hierarchy of distributed controls," says Mr. Kolb. "This is the way we've got to go. It's going to cost big bucks to do this."

With a shortage of bucks, he indicates, it's important to get the maximum use of brainpower. "The development costs for software are going up," he says. "Hardware is going down but the software development cost is going up."

It was to minimize the software cost that the AISE task force was formed. "If we develop software for a BOP shop in this facility, why can't you take that software and put it on a BOP shop over there? The physical reaction's the same," says Mr. Kolb.

There is another question being asked by steel producers. Why can't there be a closer coupling of steelmaking, continuous casting and hot rolling? With 20 large casters coming onstream, the desire for a non-stop flow of steel is providing extra impetus to the computer drive.

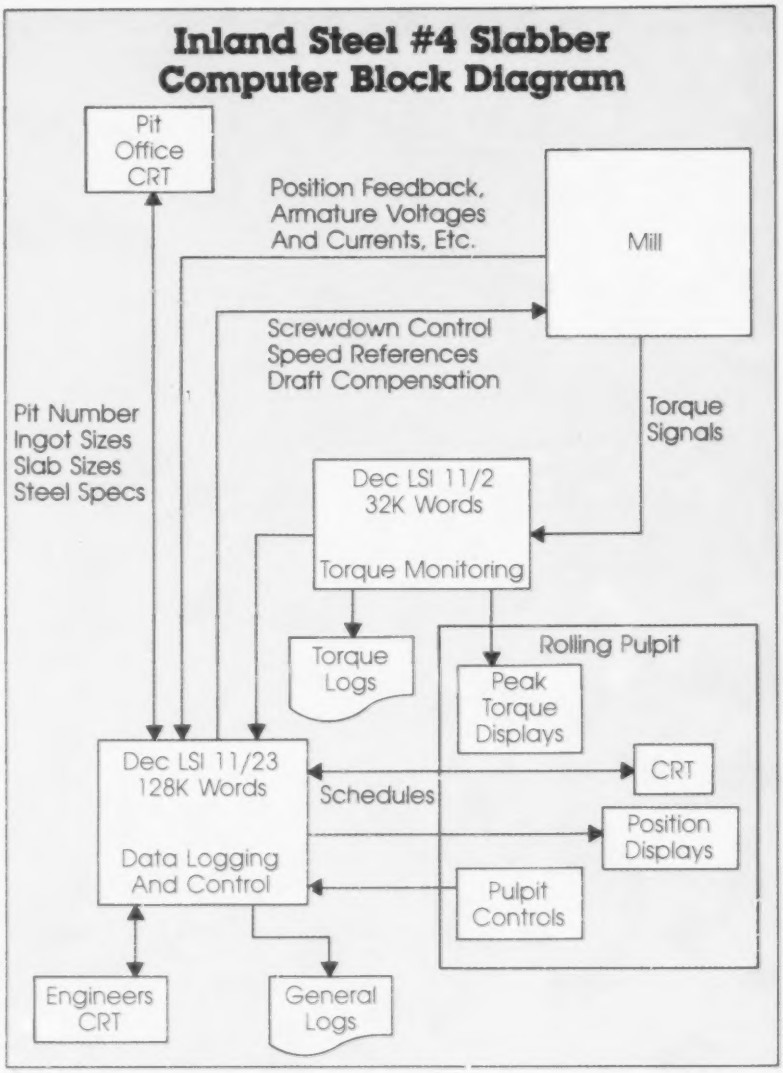
Apart from this, the sheer size and complexity of the new casters call for highly sophisticated control. At Indiana Harbor, Jones & Laughlin is installing two machines with combined capacity of more than 3 million tons a year.

The caster control system is being fitted into a hierarchy that is topped by a host computer. This is linked to the IBM corporate mainframes.

Under the host computer is a long, horizontal string of process control computers. The BOF computer is a memory base unit. Now being installed is the continuous casting computer. Planned for the future is the replacement of strip mill computers with new generation models.

In operation, the host computer receives the production schedule from the business computer. "After a heat is made or a slab is cast, a packet of information is sent back up through the host to the corporate mainframe," says Mr. Henn. "That is used for archiving and storage for later analysis." A portion of the analysis is done is J&L's new Integrated Quality Control System.

The host computer sends instructions down to the BOF computer first, then to the caster and strip mill computers. Material is tracked by the host as it goes from one process to another. J&L calls the tracking function management of materials flow.



There is continuous monitoring and adjustment at the central computer. If there is an upset at the caster, the host will go back to the BOF and modify its schedule.

"We get communications down from the host plus each one of these horizontal guys can talk to each other," says Mr. Henn.

Instructions from the host are primarily concerned with the operating sequence and the product specifications. The process computer will work with dynamic models in determining exactly how the end result will be achieved. The mechanics of operating the BOF are carried out by a programmable controller.

The BOF process computer adjusts its plan according to data fed back from the chemical lab computer.

The continuous casters at Indiana Harbor have 16 intelligence systems. There is a provision for making width adjustments on the fly. "We download from the computer when the width is to change," says Mr. Henn. "We drive in the mold faces to the new width. All this is done by automatic conversation with the process control computer."

Computers also regulate the flow of cooling water. "We've got all kinds of weighing systems which have their own little onboard computers that speak to the casting computer," says Mr. Henn.

"There's a lot of protocol and handshaking and error checking that goes on. We've got to make sure that the validity of the data is intact. There is always a 'Hello, are you there?' handshake."

A vast amount of operating information is logged and uploaded for subsequent quality analysis. In addition, there is a running check of something like 199 abnormalities. J&L plans to make extensive use of hot charging, and operators must know on the spot if a

slab will require cold inspection and conditioning.

Deviations from the prescribed mold levels or casting speeds are automatically noted. Some use is made of sensing devices. However, it is still considered desirable to have visual inspection of the hot slabs. J&L would love to have an automatic hot inspection device but isn't aware of any such animal.

A major concern of the control program is coordination of the caster with the steel shop. "One of the biggest software packages in the caster computer is obviously the management of metal flow," says Mr. Henn. For fully continuous casting, steel must arrive at the caster at the right time and at the right temperature.

With this in mind, the caster computer is constantly looking over its shoulder to see how the steel shop is doing. The caster computer is also advising the BOF of where it stands.

"The tracking of the BOF starts at the oxygen blow," says Mr. Henn. "The caster computer keeps looking back and there's a caster schedule on a CRT screen in the BOF pulpit."

The need for this kind of coordination is one of the big reasons for hierarchial control. If a big slab caster comes to a full stop, there are significant production losses.

"You now have to think of two processes as one," says Eugene A. Mizikar, director of technical analysis at J&L research.

The next big challenge for J&L's systems people will be to unify casting and hot strip mill operations. "We're doing an off-line simulation to see how we can schedule a hot strip mill and a caster so that we can maximize hot charging," says Mr. Henn.

This is quite a trick. The strip mills run more than 3,000fpm The caster casts at five or six feet per minute. The mill has to operate with a certain sequence of slab widths. The caster will be delivering some hot slabs and some cold slabs.

At Bethlehem's Burns Harbor plant, the new continuous heat treating line has a product mix that calls for very precise control with a high degree of flexibility.

For this job, Bethlehem has gone to a distributed system with three types of control. A process control computer receives information on orders from the plant's business system.

The process computer devises an operating schedule that will minimize temperature changes. The schedule is displayed to the operator, who gets the coils from storage in the order that they have been lined up by the computer. In devising temperature instructions, the computer looks ahead four or five coils. Temperature changes can't be made instantaneously and it is necessary to anticipate the arrival of a particular coil.

The actual operation of the line is controlled by two separate computers. A digital unit controls sequence and line speeds. During a temperature transition, the computer will speed or slow the line to provide the prescribed thermal treatment.

An analogue computer controls temperature by varying fuel flow and air in take on the basis of instructions from the supervisory computer. "A digital control is like a light switch with on-off positions," says Mr. Barsic of Bethlehem. An analogue is "like having a dimmer where you can control the intensity of the light."

The direct controls feed back information to the process computer. "It can make decisions on bumping the speed a little if there is a temperature change," says Mr. Barsic. "The programmable controller and the temperature controller are all working hand in hand."

Comparing the distributed system with what might have been installed 10 or 15 years ago, Mr. Barsic cites several differences.

"The temperature controller would have been done in analogue hardware. The sequencing function would have been done in relay logic. I'm not aware of any continuous annealing lines that had computer control 10 or 15 years ago."

Communications are simplified with distributed control, says Mr. Barsic, and you're not occupying up a large central computer with signals relating to only one specific task.

"You don't have to tie up a large computer doing little sequencing type of functions," says David Morton, superintendent of the Burns Harbor control department.

The heat treatment system at Burns Harbor is just one part of a plant network. Process computers talk to each other and the process system interfaces with the business system.

As has been indicated, it is a new generation of computer hardware that has made possible the systems of Burns Harbor and other plants. The Bethlehem line uses DEC 1144 (Digital Equipment Corp.) as the supervisory process controller.

The digital unit which controls sequencing is an AutoMate from Reliance Electric Co. The analogue unit for temperature control is from ECM Controls, Inc.

The Jones & Laughlin system at Indiana Harbor has a DEC 1144 as the host computer. This uses DEC software to communicate upward to the business system.

The Indiana Harbor BOF has a DEC 1124 computer. The continuous caster has a DEC 1144. "A Fisher instrumentation subsystem controls all the spray water flows, all the mold water flows," says Mr. Henn. "It has its own data highway linked into the DEC computer."

For direct process control, Armco is replacing existing computers with MODCOMP Classics (Modular Computer Systems, Inc.). "At higher levels, we're primarily using DEC 1170 units for what we call area scheduling," says Mr. Tuttle of Armco.

For U.S. Steel's Fairfield seamless mill, responsibility for individual control systems has been assigned to instrument, electrical and mechanical suppliers.

"The furnace on the front end would be Leeds & Northrup," says Mr. Kolb. "That would be the old heating furnace. The hot mill will be all General Electric. The two reheat furnaces would be all Davy McKee.

The quench and temper system is coming from Flinn & Dreffein Engineering Co. with computers from EMC. Zygo Corp. is providing level one measurement and sensing systems.

Morgan Construction Co. is building the mechanical equipment for the Fairless seamless mill. Morgan is also the prime contractor for the mill's automated process storage system. This will feature computerized stacking and retrieval of pipe.

"That's going to be quite a system," says Mr. Kolb of U.S. Steel. "It's like an automatic supermarket."

Kawasaki Steel Corp. has ordered an IBM Advanced Control System (ACS). This is a standard business model equipped with software, suitable for broad supervision. An ACS unit is being considered by STELCO, Inc.

"My feeling is the steel industry has been concerned with islands of operation," says Mr. Holland of IBM. "They're beginning to address plantwide control." IBM is planning a Pittsburgh workshop that will provide operators with hands-on control experience.

The control market has an international flavor. Process Corp. of Pittsburgh was recently awarded a contract that includes software for National Iron and Steel Mills, Ltd., of Singapore. Selective Electronics, Inc., which is Swedish-owned, has received four North American orders for its Optocar noncontact measuring system.

Raytek, Inc., of Santa Cruz, Calif., has supplied non-contact temperature measurement instruments to Allegheny Ludlum Steel Corp., Carpenter Technology Corp. and many others.

MR20

AccuRay Corp. of Columbus, Ohio, has just introduced a non-contact system designed to measure sheet thickness within a range of plus or minus 1 pct.

The spread of hierarchial control is tending to broaden the roles of suppliers. People are thinking more of systems and less of isolated components.

"All the suppliers are becoming more problem oriented," says Mr. Maroney of Leeds and Northrup.

"The market is looking for vendors who have a total capability," says Andrew S. Chatha, metals industry sales specialist for Foxboro Co. Foxboro is concerned with instrumentation in the liquid and heating stages of steelmaking.

Mr. Chatha notes that direct process controls must be effective before the large networks can function. "Before they get there, they have to upgrade their individual systems," he says.

"We feel as a company there's a lot more that can be done in the instrument area," he says. "There's a trend toward on-line instrumentation. People don't want to take a sample every so often."

One critical need is for a device that will make a hot inspection of continuously cast steel. Honeywell Inc. and U.S. Steel have done developmental work on such a system.

"Our program has just completed the concept phase," says Donald E. Waters, program manager for Honeywell. "We feel we have proved the feasibility of this concept. The Department of Energy is looking for the steel industry to put a consortium together to carry on this program."

Magnaflux Corp. has developed a new generation of automated inspection systems. These automatically sort out products with defects. The product is marked to indicate the location of the flaw.

For control of metal level in billet casting, Nippon Kokan has developed a pencil-thin detection head for a small eddy current sensor. Selective Electronics uses a non-contact laser measuring probe in a new molten metal monitoring device.

Raytek Inc. has come out with what it calls the first microprocessor-based infrared temperature measurement system. One of the aims of the steel industry is non-contact measurement of chemistry as well as temperature.

New sensing devices are being developed all the time. Not all suppliers are encouraged by the industry's response. "We've got a big bag of tricks here," says George J. Muska, manager of equipment sales and services for Koppers Co., Inc.

Koppers recently took on a broad line of European instruments and controls. "There's an awful lot of interest, but that's where it stops," says Mr. Muska.

There is considerable interest in monitoring and adjusting shape on sheet mills. At Warren, Ohio, Republic Steel Corp. has installed an ASEA shape control on a four-stand cold mill. Davy-Loewy has had more than 40 orders from aluminum and steel companies for its Vidicom shape meter.

Gould Inc. reports good results from its proximity sensors and programmable controllers in plate mill and pipe mill applications. Without making physical contact, the sensors can detect the presence of steel as close as 1mm and as far away as 50mm.

Closely linked to the instrument systems are the programmable controllers. These perform the actual control steps on the basis of signals from instruments and instructions from the process computers.

"The programmable controller is a relatively simple device that replaces relays," says Richard Clark of Westinghouse Electric. "They're programmed in a fairly simple way with ladder diagrams."

Until recently, there was a clear-cut distinction between control and instrumentation. "Programmable controllers have been on the digital side," says Byron Hartman, who is in application engineering at Allen-Bradley Co. "The instrument people have been on the analogue side."

There is now a blending of the two modes, Mr. Hartman indicates. Fisher Controls offers an interface unit which links its instrument system with programmable controllers. The interface accepts both discrete and analogue values from the controller. A Fisher system controls the cooling sprays on the J&L Indiana Harbor caster.

The controller area is active. "Our experience has been that the steel industry was behind and they're catching up fast," says William Roeder of Reliance Electric Co.

Eaton Corp's Cutler Hammer group recently came out with a self-prompting programmable controller. The operator is prompted through ladder diagram sequences.

Square D Co. provides a nine-inch screen for prompting the operator through the programming steps. A hand held programmer permits the operator to change the control steps. As has been said, this flexibility is one of the great advantages of the programmable units.

A new Westinghouse model can control up to 55 functions and offers a simple diagnosis system. Foxboro's new unit can be operated separately or be linked to an overall system. Gould's Modicon division has come up with a new, high powered unit.

Above the programmable controllers are the process computers and the supervisory computers. At this level, advances in both hardware and software have opened the door for distributed control. MODCOMP has come out with the smallest model of its CLASSIC line. This contains 512 K bites of ECCMOS memory and is available "at a very low price."

ECM Controls introduced a major new system last year. "There is tremendous emphasis on the operator console," says Robert Kot, director of marketing for ECM.

The idea, says Mr. Kot, is to make the computer "user friendly." He likens the industrial trend to what is happening in home computers. Small children can operate home units without being steeped in computer lore. The same general concept is being applied in plant controls.

"The software has been very complex for us to write," says Mr. Kot, "but very simple for the operator to use."

He sees continuing activity as steel mills upgrade their most efficient facilities, but he doesn't see many big steel projects being launched.

The big equipment and engineering companies are deeply involved in the design of broad control networks. "We're offering a distributed control system for, say, the hot mill," says Mr. Clark of Westinghouse Electric. "Starting with the reheat furnaces, it goes through the whole roughing and finishing trains, down through the run-out tables and the coilers.

"We will talk through our gateway to a supervisory computer or production scheduling computer and then break it down into areas."

One of the keys to this kind of system is high speed communication. With its data highway, Westinghouse provides a guaranteed update of 10,000 points a second. The company supplied the control system for the continuous annealing line of Inland Steel.

Dravo Corp. has designed the computer systems for a number of big melt shops. Portions of the individual controls systems are provided by equipment companies by Dravo has devised the overall architecture.

"One of the things we're shooting for is a paperless production flow," says Jeffrey L. Hoffman, senior systems analyst for Dravo. "Information is transmitted from computer to computer." □

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METALWORKING ORDER TRENDS

Prices firm up, but it's not a 'return of inflation'

Some headlines in early September declared, "Inflation is back."

That takes the prize for the silly headline of the month. It is true that producer finished goods prices in August did rise at a faster clip than they had for several months. But that's about it. And that is what the headlines were all about.

Finished goods prices at the wholesale level during August rose by 0.4 pct from July. That comes out to a 4.8 pct annual rise rate if the August pace were to be maintained for a year.

But in August, these prices were up by 1.4 pct from the year-ago month. That is the same year-to-year rate as scored in July.

And, most notably, the 1.4 pct rise rate in August was far less than the 2.1 pct average year-to-year pace through the first six months of the year.

So, the August producer price showing hardly calls for headlines declaring that 'inflation is back.'

Technically, of course, inflation never went away. Prices had not fallen prior to August; instead, the rate of price advances slowed.

Too, there was a special reason for most of the price rise in August. Food prices rose at a near-5 pct annual rate. This was due chiefly to the hot, dry summer that caused widespread crop damage. Food weighs heavily in producer price data, so the rise here did much to push up the overall August producer price data.

Still, there was one suprise in the August price data. Tags on capital equipment were up by 0.7 pct from July. This was the largest monthly increase in almost two years.

Labor Department analysts attribute much of the August capital equipment price rise to steep markups on tags for motor vehicles.

The analysts also noted that, "Prices for textile machinery, printing trades machinery and metal-cutting machine tools rose rapidly after little or no change in July."

Other capital equipment lines scoring accelerated price hikes in August: Aircraft and agricultural machinery.

The table here listing 22 key metalworking product lines shows a general continuing price softness. One-half of the listed products show price decreases or a no-change status in August.

The average over-the-year price of these products gives a true picture of the inflation rate. That's 2.0 pct.

Latest Month Covered: August, 1983

Products	Index Reading For Month (1967 = 100)	Pct Change From Previous Month	Pct Change From Year-Ago Month
Metal Cutting Machine Tools	377.8	+ 0.2	+ 2.1
Metal Forming Machine Tools	416.2	0	+ 1.3
Agricultural Machinery & Equip.	327.1	+ 0.3	+ 4.8
Construction Machinery & Equip.	352.8	0	+ 1.8
Industrial Process Furnace & Ovens	362.4	+ 0.2	+ 2.1
Industrial Material Handling Equip.	285.1	+ 0.1	− 0.2
Pumps, Compressors & Allied Equip.	345.3	− 0.7	− 0.7
Fluid Power Equip. (Dec. 1970 = 100)	253.5	0	+ 2.8
Mechanical Power Transmission Equip.	314.9	0	− 0.2
Automobiles	218.4	+ 0.4	+ 1.6
Motor Trucks—Light	270.3	+ 0.3	+ 1.2
Motor Trucks—Heavy	313.6	0	+ 3.5
Railroad Equipment	357.8	− 0.1	+ 2.9
Fabricated Metal Structural Products	302.8	+ 0.2	− 0.5
Electric Motors	333.7	+ 0.9	+ 7.9
Valves (Metal, Ex-Fluid Power—Dec. 1982=100)	99.8	− 0.1	NA
Ball & Roller Bearings	330.9	0	− 1.3
Cutting Tools & Accessories	273.6	− 0.7	+ 0.7
Heating Equipment	244.8	+ 0.3	+ 2.7
Plumbing Fixtures & Brass Fittings	291.9	− 0.1	+ 6.3
Metal Containers	338.0	+ 0.2	+ 2.8
Miscellaneous Metal Products	287.6	+ 0.1	+ 1.5

Data based on U.S. Labor Dept.'s Producer Price Index

MATERIALS NEWSFRONT

Price & Production Data

Steel production by districts, thousands of tons (000 omitted)

	Last Week	Two Weeks Ago	Month Ago	Year Ago
North East Coast	175	176	178	157
Buffalo	30	32	30	31
Pittsburgh	203	180	209	130
Youngstown	101	93	96	61
Cleveland	133	145	132	100
Detroit	96	84	111	110
Chicago	459	484	467	366
Cincinnati	102	100	86	67
St. Louis	76	73	72	51
Southern	152	150	149	74
Western	95	96	89	62
U.S. Production	1,622	1,613	1,623	1,209

Source: American Iron & Steel Institute

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports. Rail transportation, handling and unloading may be charged to the account of the buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural)..... gross-ton 80.50-86.9*
Old range, non-bessemer ..... gross-ton $32.78
Mesabi, regular-unscreened ..... gross-ton $32.53
Mesabi, non-bessemer .....gross-ton $32.25-32.53**

*80.50¢—Pickands Mather as of 1/27/81.
**86.9¢—U. S. Steel as of 3/15/82, Cleveland-Cliffs as of 2/26/82, Oglebay Norton as of 3/25/82, and Hanna Mining as of 2/26/82.

Steel Production, Composite Prices

(Effective September 26, 1983)

U.S. Steel Production	Last Week	Two Weeks Ago	To Date 1983	To Date 1982
Net tons, in thousands	1,622	1,613	59,719	56,164
Capability Utilization Rate	56.3	56.0	54.2	49.9

Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (¢/lb.—eff. 9/1/83)	26.822	26.822	26.217	25.297
Pig Iron* * (Net ton=2000 lbs.)	$213.00	$213.00	$213.00	$213.00
Scrap No. 1 hvy.* * * (Gross ton=2240 lbs.)	$ 77.50	$ 77.17	$ 76.17	$ 55.50
No. 2 bundles	$ 45.50	$ 45.50	$ 45.50	$ 40.50

Scrap Comparison (Gross Ton)				
No. 1 steel, Pittsburgh .	$ 82.50	$ 82.50	$ 82.50	$ 57.50
No. 1 steel, Philadelphia	70.50	69.50	68.50	59.50
No. 1 steel, Chicago.....	79.50	79.50	77.50	49.50
No. 1 bundles, Detroit..	75.50	75.50	73.50	47.50
Low Phos., Youngstown	84.50	84.50	79.50	63.50
No. 1 mach'y cast., Pgh	74.50	74.50	74.50	71.50
No. 1 mach'y cast., Phila	95.50	95.50	95.50	98.50
No. 1 mach'y cast., Chi..	109.50	109.50	109.50	103.50

*Finished Steel Composite
Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.
* *Pig Iron Composite
Based on average prices for basic and foundry pig iron at representative producing points within the U.S.
* * *Steel Scrap Composite
Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

Nonferrous Prices

(Effective September 26, 1983)
Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum	76.00-81.00 (Nom.)	76.00	8/29/83
Copper (C)	73.50-74.00	74.00	9/22/83
Lead	22.00-23.00	22.50-23.00	9/22/83
Magnesium Ingot	138.00	134.00-138.00	6/1/83
Nickel	329.00	350.00	11/25/81
Titanium Sponge	555.00-585.00	555.00	4/29/82
Zinc	46.00	43.00-46.00	8/30/83

ALUMINUM: 99.5%. COPPER (C) = cathode. LEAD: common grade. MAGNESIUM: 99.8% pig, delivered. NICKEL: electro., Port Colborne, Canada. ZINC: high grade.

Antimony, American Laredo, Texas . $2.00
Beryllium-aluminum 5% Be, per lb. contained Be $215.00
Beryllium-copper, per lb. cont. Be $130.00
Beryllium 97% powder 200 ..... $178.00
Bismuth, ton lots ..... $1.85-$1.95
Cadmium, ton lots $1.25
Calcium, ton lots, crown $3.05
Chromium, 99.8% $3.75
Cobalt, 99%, cathode $12.50
Gold per troy oz. $415.00
Indium, dollars per troy oz. ..... $3.20-$3.50
Iridium, dollars per troy oz. $600
Magnesium sticks, 10,000 lbs. $1.91
Mercury, per 76-lb. f.o.b. N.Y. ..$290-$300
Molybdenum, lb. tech. moly oxides, 20 lb. MO can $5.65
Nickel oxide sinter at U.S. points of entry $3.12
Palladium, per troy oz. $140
Platinum, per troy oz. $475
Rhodium, per troy oz. $600.00
Silver ingots, per troy oz. $11.98
Vanadium $4.94
Zirconium sponge ..... $12.00-$17.00
(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb, EX-SMELTER, based on daily market in Penang in Malaysian dollars per kilo.)

Sept. 19—572.64 Sept. 22—578.03
Sept. 20—574.34 Sept. 23—580.30
Sept. 21—572.65

Scrap Prices

Brass Mill Scrap

(Cents per lb; over 20,000 lbs. add 1¢ per lb)

	Solids	Turning
Copper	72⅛	66½
Yellow brass	62⅞	59¼
Red brass	66⅞	62
Comm. bronze	67⅞	63¼
Mang. bronze	64¼	61¼
Free cutting rod ends	59	58

Custom Smelters Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	67
No. 2 copper wire	58
Light copper	49

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	63
No. 2 copper wire	54
Light copper	45
No. 1 composition	55
No. 1 comp. turnings	53
Hvy. yellow brass solids	36
Hvy. yellow brass turnings	29
Radiators	46

Aluminum

New mixed clips	51	—52
Old sheet	49	—50
Old cast	49	—50
Clean dry borings	48	—49

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum

Segregated clippings	50	—51
Mixed L.C. clips	48	—49
Old sheets and cast	48	—49
Borings and turnings	24	—25
Duraluminum clippings	29	—30

Copper and Brass

No. 1 copper wire	57	—58
No. 2 copper wire	50	—51
Light copper	45	—46
Radiators	37	—38
No. 1 composition	46	—47
No. 1 composition turn'gs	44	—45
Cocks and faucets	32	—33
Clean heavy yellow brass	30	—31
Brass Pipe	31	—32
New soft brass clippings	45	—46

Lead

Heavy soft lead	8	— 9
Whole batteries	3	— 4
Type metal	15	—16
Electrotype	13	—14

Nickel

Nickel solids	110	—120
Nickel rod ends	110	—120
Nickel sheets, clips	110	—120
Nickel turnings	50	— 60

Zinc

New zinc clippings	15	—16
Old diecast zinc	9	—10

EFFECTIVE SEPTEMBER 26, 1983

MATERIALS NEWSFRONT

(Effective September 26, 1983) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of *Iron Age* editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	$ 82.00 to	$ 83.00
No. 2 hvy. melting	72.00 to	73.00
No. 1 dealer bundles	99.00 to	100.00
No. 1 factory bundles (auto)	97.00 to	98.00
No. 2 bundles	51.00 to	52.00
No. 1 busheling	94.00 to	95.00
Machine shop turn.	10.00 to	11.00
Shoveling turnings	35.00 to	36.00
Cast iron borings	34.00 to	35.00
Low phos. punchings plate	99.00 to	100.00
Heavy turnings	72.00 to	73.00
No. 1 RR hvy. melting	90.00 to	91.00
Rails 2 ft. and under	103.00 to	104.00
Scrap rails, random lgth.	91.00 to	92.00
RR specialties	98.00 to	99.00
No. 1 machinery cast	74.00 to	75.00
Cupola cast	67.00 to	68.00
Heavy breakable cast	30.00 to	31.00
Stainless		
18-8 bundles and solids	600.00 to	610.00
18-8 turnings	500.00 to	510.00

Chicago

No. 1 hvy. melting	$ 79.00 to	$ 80.00
No. 2 hvy. melting	72.00 to	73.00
No. 1 dealer bundles	99.00 to	100.00
No. 1 factory bundles (auto)	99.00 to	100.00
No. 2 dealer bundles	44.00 to	45.00
No. 1 busheling	97.00 to	98.00
Shredder scrap	84.00 to	85.00
Machine shop turn.	25.00 to	26.00
Mixed bor. and turn.	26.00 to	27.00
Shoveling turnings	31.00 to	32.00
Cast iron borings	44.00 to	45.00
Low phos. forge crop	99.00 to	100.00
Low phos. punchings plate ¼ in. and heavier	109.00 to	110.00
Low phos. 2 ft. and under	105.00 to	106.00
No. 1 RR hvy. melting	94.00 to	95.00
Scrap rails, random lgth.	81.00 to	82.00
Reroller rails	95.00 to	96.00
Rails, 2 ft. and under	102.00 to	103.00
RR couplers and knuckles	92.00 to	93.00
RR car axles	114.00 to	115.00
No. 1 machinery cast	109.00 to	110.00
Cupola cast	97.00 to	98.00
Stove plate	92.00 to	93.00
Steel car wheels	98.00 to	99.00
Stainless		
18-8 bundles and solids	570.00 to	580.00
18-8 turnings	470.00 to	480.00
430 bundles and solids	135.00 to	140.00
430 turnings	100.00 to	105.00

Philadelphia

No. 1 hvy. melting	$ 69.00 to	$ 72.00
No. 2 hvy. melting	55.00 to	58.00
No. 1 dealer bundles	81.00 to	84.00
No. 2 dealer bundles	39.00 to	42.00
No. 1 busheling	81.00 to	84.00
Shredder scrap	82.00 to	85.00
Machine shop turn.	23.00 to	26.00
Mixed bor. and turn.	23.00 to	26.00
Shoveling turnings	41.00 to	44.00
Low phos. 5 ft. and under	81.00 to	84.00
Low phos. 2 ft. punchings	92.00 to	95.00
Electric furnace bundles	93.00 to	96.00
RR specialties	81.00 to	84.00
Rails, 2 ft. and under	94.00 to	97.00
Cupola cast	61.00 to	64.00
Heavy breakable cast	53.00 to	56.00
No. 1 machinery cast	94.00 to	97.00

Detroit

Broker buying prices per gross ton on cars:

No. 1 hvy. melting	$ 59.00 to	$ 60.00
No. 2 hvy. melting	57.00 to	58.00
No. 1 dealer bundles	75.00 to	76.00
No. 2 bundles	37.00 to	38.00
No. 1 busheling	73.00 to	74.00
Drop forge flashings	49.00 to	50.00
Machine shop turn.	30.00 to	31.00
Mixed borings and turn.	19.00 to	20.00
Shoveling turnings	30.00 to	31.00
Cast iron borings	27.00 to	28.00
Heavy breakable cast	35.00 to	36.00
Mixed cupola cast	51.00 to	52.00
Automobile cast	74.00 to	75.00
Stainless		
18-8 bundles and solids	470.00 to	480.00
18-8 turnings	350.00 to	360.00
430 bundles and solids	115.00 to	125.00

Youngstown

No. 1 hvy. melting	$ 71.00 to	$ 74.00
No. 2 hvy. melting	49.00 to	52.00
No. 1 dealer bundles	87.00 to	90.00
No. 2 dealer bundles	37.00 to	40.00
Machine shop turn.	3.00 to	5.00
Shoveling turnings	7.00 to	10.00
Low phos. plate	83.00 to	86.00
Electric furnace bundles	78.00 to	81.00
Galvanized bundles	70.00 to	73.00

Cleveland

No. 1 hvy. melting	$ 67.00 to	$ 70.00
No. 2 hvy. melting	32.00 to	35.00
No. 1 dealer bundles	85.00 to	88.00
No. 1 factory bundles	90.00 to	93.00
No. 2 bundles	22.00 to	25.00
No. 1 busheling	84.00 to	87.00
Machine shop turn.	1.00 to	4.00
Mixed bor. and turn.	1.00 to	4.00
Shoveling turnings	3.00 to	6.00
Cast iron borings	6.00 to	9.00
Cut structural & plates, 2 ft. and under	99.00 to	102.00
Low phos. punchings plate	99.00 to	102.00
Drop forge flashings	37.00 to	40.00
Foundry steel, 2 ft. & under	57.00 to	60.00
No. 1 RR hvy melting	77.00 to	80.00
Rails, 2 ft. and under	105.00 to	108.00
Rails, 18 in. and under	106.00 to	109.00
Steel axle turnings	67.00 to	70.00
Railroad cast	80.00 to	83.00
No. 1 machinery cast	87.00 to	90.00
Cupola cast	60.00 to	63.00
Stove plate	45.00 to	48.00
Stainless		
18-8 bundles	325.00 to	335.00
18-8 turnings	275.00 to	285.00
430 bundles	80.00 to	85.00

Buffalo

Broker buying prices per gross ton on cars:

No. 1 hvy. melting	$ 58.00 to	$ 59.00
No. 2 hvy. melting	47.00 to	48.00
No. 1 busheling	69.00 to	70.00
No. 1 dealer bundles	69.00 to	70.00
No. 2 bundles	30.00 to	31.00
Machine shop turn.	12.00 to	13.00
Mixed bor. and turn.	13.00 to	14.00
Shoveling turnings	17.00 to	18.00
Cast iron borings	12.00 to	13.00
Low phos. plate	69.00 to	70.00
Structural and plate, 2 ft. and under	70.00 to	71.00
Rails, 2 ft. and under	78.00 to	79.00
Scrap rails, random lgth.	82.00 to	83.00
No. 1 machinery cast	67.00 to	68.00
No. 1 cupola cast	48.00 to	49.00

St. Louis

No. 1 hvy. melting	$ 69.00 to	$ 70.00
No. 2 hvy. melting	58.00 to	59.00
Foundry steel, 2 ft.	57.00 to	58.00
No. 1 dealer bundles	69.00 to	70.00
No. 2 bundles	55.00 to	56.00
Machine shop turn.	17.00 to	18.00
Shoveling turnings	24.00 to	25.00
Cast iron borings	35.00 to	36.00
No. 1 RR hvy. melting	79.00 to	80.00
Rails, random length	76.00 to	77.00
Rails, 18 in. and under	92.00 to	93.00
RR specialties	85.00 to	86.00
Cupola cast	70.00 to	71.00
Heavy breakable cast	48.00 to	49.00
Stove plate	75.00 to	76.00
Cast iron car wheels	49.00 to	50.00
Rerolling rails	97.00 to	98.00
Unstripped motor blocks	57.00 to	58.00

Birmingham

No. 1 heavy melting	$ 70.00 to	$ 71.00
No. 2 heavy melting	64.00 to	65.00
No. 1 dealer bundles	71.00 to	72.00
No. 2 bundles	50.00 to	51.00
No. 1 busheling	71.00 to	72.00
Shredder scrap	87.00 to	88.00
Machine shop. turn.	24.00 to	25.00
Shoveling turnings	32.00 to	33.00
Cast iron borings	33.00 to	34.00
Electric furnace bundles	67.00 to	68.00
Elec. furnace, 3 ft. & under	64.00 to	65.00
Structural and plate, 2 ft.	94.00 to	95.00
Structural and plate, 4 ft.	90.00 to	91.00
No. 1 RR hvy. melting	71.00 to	72.00
Scrap rails, random lgth.	81.00 to	82.00
Rails, 18 in. and under	94.00 to	95.00
Angles and splice bars	88.00 to	89.00
No. 1 cupola cast	84.00 to	85.00
Unstripped motor blocks	64.00 to	65.00

Cincinnati

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 60.00 to	$ 61.00
No. 2 hvy. melting	53.00 to	54.00
No. 1 dealer bundles	69.00 to	70.00
No. 2 bundles	28.00 to	29.00
Machine shop turn.	6.00 to	7.00
Shoveling turnings	9.00 to	10.00
Cast iron borings	13.00 to	14.00
Low phos. 18 in. and under	88.00 to	89.00
Rails, random length	70.00 to	71.00
Rails, 2 ft. and under	66.00 to	69.00
No. 1 cupola cast	66.00 to	67.00
Heavy breakable cast	33.00 to	34.00
Drop broken cast	79.00 to	80.00

New York

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 34.00 to	$ 35.00
No. 2 hvy. melting	30.00 to	32.00
No. 2 dealer bundles	22.00 to	23.00
Mixed bor. and turn.	7.00 to	8.00
Machine shop turn.	4.00 to	5.00
Shoveling turnings	10.00 to	12.00
Clean cast. chem. borings	34.00 to	35.00
No. 1 machinery cast	89.00 to	90.00
Mixed yard cast	38.00 to	39.00
Heavy breakable cast	14.00 to	15.00
Stainless		
18-8 prepared solids	490.00 to	510.00
18-8 turnings	390.00 to	410.00
430 prepared solids	70.00 to	80.00
410 solids	60.00 to	70.00

Boston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 45.00 to	$ 47.00
No. 2 hvy. melting	35.00 to	37.00
No. 1 dealer bundles	57.00 to	59.00
No. 2 bundles	31.00 to	33.00
No. 1 busheling	57.00 to	59.00
Shredder scrap	57.00 to	59.00
Machine shop turn.	5.00 to	7.00
Shoveling turnings	9.00 to	11.00
No. 1 machinery cast	95.00 to	100.00
Mixed cupola cast	30.00 to	32.00
Heavy breakable cast	8.00 to	10.00

San Francisco

No. 1 hvy. melting	$ 42.00 to	$ 44.00
No. 2 hvy. melting	34.00 to	36.00
No. 1 dealer bundles	29.00 to	31.00
No. 2 dealer bundles	13.00 to	15.00
Machine shop turn.	6.00 to	8.00
Cast iron borings	6.00 to	8.00
No. 1 cupola cast	85.00 to	87.00

Los Angeles

No. 1 hvy. melting	$ 40.00 to	$ 42.00
No. 2 hvy. melting	29.00 to	31.00
No. 1 dealer bundles	27.00 to	29.00
No. 2 dealer bundles	10.00 to	12.00
Machine shop turn.	6.00 to	8.00
Shoveling turnings	10.00 to	12.00
Cast iron borings	6.00 to	8.00
Elec. furnace, 1 ft. and under (foundry)	85.00 to	87.00
No. 1 cupola cast	87.00 to	89.00

Seattle

No. 1 hvy. melting	$ 59.00 to	$ 61.00
No. 2 hvy. melting	48.00 to	50.00
No. 2 bundles	38.00 to	40.00
No. 1 cupola cast	94.00 to	96.00
Mixed yard cast	81.00 to	83.00

Hamilton, Ont.

Brokers buying price per net ton on cars:

No. 1 heavy melting	$ 60.00
No. 2 heavy melting cut 2 ft. and under	57.00
No. 1 dealer bundles	65.00
No. 2 bundles	35.00
Mixed steel scrap	39.00
Bush. new fact. prep'd.	63.00
Bush. new fact. unprp'd.	55.00
Machine shop turn.	30.00
Short steel turn.	33.00
Mixed bor. and turn.	20.00
Cast scrap	53.00

Houston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 76.00 to	$ 77.00
No. 2 hvy. melting	58.00 to	60.00
No. 2 bundles	37.00 to	38.00
Machine shop turn.	21.00 to	22.00
Crushed turnings	39.00 to	41.00
Shredder scrap	76.00 to	77.00
Cut structural plate 2 ft. and under	91.00 to	94.00
Unstripped motor blocks	57.00 to	59.00
Cupola cast	78.00 to	80.00

STEEL PRICES

Producer Key
With Principal Offices

A4 American Cladmetals Co., Carnegie, Pa.
A7 Armco Inc., Middletown, Ohio
A8 Atlantic Steel Co., Atlanta, Ga.
A11 Atlantic Wire Co., Branford, Conn.

B1 Baron Drawn Steel Corp., Toledo, Ohio
B3 Bethlehem Steel Corp., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B6 Bliss & Laughlin Steel Co., Harvey, Ill.

C1 Calstrip Corp., Los Angeles
C8 CF&I Steel Corp., Pueblo, Colo.
C10 Copperweld Steel Co., Warren, Ohio
C11 Crucible Divisions, Colt Industries, Pittsburgh, Pa.
C15 G. O. Carlson, Inc., Thorndale, Pa.
C16 Connors Steel Co., Birmingham, Ala.
C20 Calumet Steel Div., Chicago Heights, Ill.
C21 Cumberland Steel Co., Cumberland, Md.

D1 Detroit Strip Div., Cyclops Corp.
D2 Driver Wilbur B., Co., Newark, N. J.
D3 Driver Harris Co., Harrison, N. J.

E3 Enamel Products & Plating Co., McKeesport, Pa.
E4 Elliot Bros. Steel Co., New Castle, Pa.

F1 Firth Sterling, Inc., McKeesport, Pa.

G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Division, National Steel Corp., Ecorse, Mich.
G4 Greer Steel Co., Dover, O.
G5 Green River Steel Corp., Owensboro, Ky.
G6 Gibraltar Steel Corp., Buffalo, N. Y.
G7 Georgetown Steel Corp., Georgetown, S. C.
G8 Guterl Special Steel Corp.

H1 Hercules Drawn Steel Corp., Livonia, Mich.

I2 Ingersoll Steel Div., New Castle, Ind.
I3 Inland Steel Co., Chicago, Ill.
I4 Interlake Steel Corp., Chicago

J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Calif
K2 Keystone Consolidated Industries, Inc.
K3 Kentucky Electric Steel Co., Ashland, Kentucky
K5 Kemco Div., Foote Mineral Co., Keokuk, Iowa

L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.
L5 Litho-Strip Corp., Chicago

M2 McLouth Steel Products Corp.
M4 Mid States Steel & Wire Co., Crawfordsville, Ind.
M8 Mill Strip Products Div., National Steel Service Center, National Steel Corp.
M9 Molitrup Steel Products Co., Beaver Falls, Pa.
M11 Midwest Steel Div., National Steel Corp., Portage, Ind.

N1 Northeast Precision Steel Co., Boston, Mass.
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N8 Northwest Steel Rolling Mills, Seattle, Wash.
N9 Nelsen Steel & Wire Co., Chicago, Ill.
N10 North Star Steel Co., Saint Paul, Minnesota

O2 Oregon Steel Mills, Portland, Ore.

P2 Phoenix Steel Corp., Claymont, Del.
P3 Wyckoff Steel Div., Plymouth, Mich.
P9 Pacific States Steel Co., Niles, Cal
P13 Penn Dixie Steel Corp., Kokomo, Ind.
P14 Pacific Tube Co., Los Angeles
P15 Philadelphia Steel and Wire Corp., Phila.

R3 Republic Steel Corp., Cleveland
R4 Ramco Steel Co., Buffalo, N. Y.
R5 Roblin Steel Corp., Inc., North Tonawanda, N. Y.
R6 Rodney Metals, Inc., New Sadford, Mass.
R7 Rome Strip Steel Co., Rome, N. Y.

S1 Sharon Steel Corp., Sharon, Pa.
S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S10 Seneca Steel Service, Buffalo, N. Y.
S16 Southern Precision Steel Co., Gulfport, Miss.

T4 Thomas Steel Strip Co., Warren, O.
T5 Timken Company, Steel Division, Canton, O.
T7 Texas Steel Co., Fort Worth, Tex.
T9 Triumph Electro Corp., Chicago, Ill.
T10 Tennessee Forging Steel Corp., Harriman, Tenn.
T11 Teledyne Columbia-Summerill, Carnegie, Pa.

U1 United States Steel Corp., Pittsburgh, Pa.

W3 Weirton Steel Division, National Steel Corp., Weirton, West Va.
W5 Wheeling-Pittsburgh Steel Corp.
W7 Wilson Steel & Wire Co., Chicago
W10 Wyckoff Steel Div., Ampco-Pittsburgh Corp., Pittsburgh, Pa.
W14 Whittaker Steel Strip Div., Detroit, Mich.

Steel Service Center Prices

Price, Dollars per 100 lb

Cities* / City Delivery Charge*	Sheets			Strip	Plates	Shapes	Bars		Alloy Bars			
	Hot-Rolled (10 gage)	Cold-Rolled (20 gage)	Galvanized (18 gage)	Hot-Rolled Strip	Plates	Standard Structurals	Hot-Rolled (merchant)	Cold Finished	Hot-Rolled 8620 As Rolled	Hot-Rolled 4140 Annealed	Cold-Drawn 8620 As Rolled	Cold-Drawn 4140 Annealed
Atlanta	22.59	29.06	30.30	30.14	21.54	22.00	17.19	31.50	38.37	50.60	69.58	73.19
Baltimore	24.14	29.19	34.19	35.43	23.60	21.91	20.13	44.87	54.85	65.06	71.57	76.32
Birmingham	22.92	27.10	30.88	30.52	22.33	23.20	17.38	33.84	49.31	68.90	68.16	74.43
Boston	25.11	28.66	31.76	40.03	32.15	35.37	20.00	39.39	50.76	55.81	65.08	71.03
Buffalo	24.57	32.12	37.61	41.68	32.91	28.77	17.88	40.38	40.10	48.82	56.33	64.06
Chicago	25.07	31.37	32.70	32.32	22.71	23.35	16.58	30.33	36.47	40.64	46.01	52.05
Cincinnati	24.46	29.11	32.58	32.26	23.70	23.49	17.63	30.51	35.04	39.58	43.36	49.78
Cleveland	25.89	30.80	34.20	34.38	26.55	27.35	16.07	30.26	34.02	39.96	44.02	50.99
Denver	33.10	38.91	38.13	41.68	34.45	35.59	21.42	41.66	51.78	59.12	67.82	70.99
Detroit	25.72	31.94	34.08	35.88	28.05	29.93	17.10	31.85	35.74	40.44	48.09	52.99
Houston	22.36	28.61	31.90	37.78	32.24	35.46	17.85	39.48	39.28	45.22	53.75	60.10
Kansas City	21.35	26.53	31.75	29.42	26.77	28.84	18.15	33.30	38.29	48.53	53.40	62.04
Los Angeles	25.20	31.50	36.22	36.97	33.73	32.55	27.00	40.90	50.17	58.10	63.85	73.22
Memphis	26.12	33.39	33.91	34.55	27.96	34.24	19.47	37.60	45.09	49.96	59.80	69.44
Milwaukee	24.86	30.72	32.54	32.01	23.77	26.33	15.92	30.87	35.95	41.55	45.68	52.45
New York	22.03	30.31	33.26	39.11	27.90	32.37	19.13	42.13	45.80	53.04	62.17	69.31
Philadelphia	26.39	35.11	36.92	46.96	30.86	36.97	19.70	39.64	48.41	52.86	62.06	69.23
Pittsburgh	26.55	32.66	35.16	41.38	32.45	29.51	20.41	41.30	46.51	54.05	61.11	68.86
Portland	25.66	33.27	38.17	31.11	31.04	34.76	27.50	44.85	49.78	57.74	70.44	....
San Francisco	25.76	32.84	36.85	34.81	29.48	32.20	28.78	48.02	57.14	68.13	76.05	84.10
Seattle	27.74	32.32	36.16	40.49	29.35	30.37	29.55	50.60	63.37	71.57	76.28	87.67
Spokane	21.00	30.34	34.28	37.91	33.00	33.75	21.50	43.01	43.20	47.52	....	58.32
St. Louis	24.07	30.42	32.35	33.03	28.14	27.29	16.48	32.42	34.06	39.65	47.02	53.40
St. Paul	24.39	27.90	31.48	32.42	26.33	28.12	15.45	32.93	34.26	39.60	44.90	52.20

Base Quantities. All HR products may be combined for quantity. Hot-rolled sheet, 10 ga x 36 x 96—120; Cold-rolled sheet, 20 ga x 36 x 120; Galv. sheet—16 ga x 36—120; Hot-rolled strip—¼" x 1"; Plate ¼" x 84/; Shapes—I-Beams 6 x 12.5; Hot-rolled bar—Rounds ¾-2 15/16; Cold finished bar—C 1018—1" rounds; Alloy bar—Hot-rolled 8620—1¾" round; Cold drawn—1" round; Hot-rolled 4140—1⅞" round; Cold drawn—1" round. Check local supplier for additions or deductions from base.

*Prices at all points include metropolitan delivery charges.

STEEL PRICES

Codes identify Producers listed in the Key on page 106. (Prices quoted are mill base prices in cents per pound unless otherwise noted and do not reflect extras or surcharges.) N.A.—Not available.

Billets, Blooms, Slabs

(Dollars per net ton)

Carbon Rerolling, Midwest	
W5	$366.00
N4	$366.00
West	
C6	$346.00
Carbon Forging, East	
B3(3), C10, U1	$453.00
R3	$453.00
Midwest	
R3, U1, W5	$453.00
S1	$420.00
C10	$453.00
K2	$453.00
W5	$453.00
West	
B3(2)	$463.00
C6	$453.00
South	
A7	$453.00
Alloy, East	
R3, C10	$492.00
B3	$492.00
Midwest	
W8, W5, C10	$492.00
U1	$492.00
R3	$492.00
S1	$459.00
West	
B3	$502.00
C6	$469.00
South	
A7	$492.00

Piling Sheet Steel

(cents per lb)

Midwest	
U1	26.45

Structurals

Carbon, East	
B3(2)	23.90
U1, J3	23.90
Midwest	
A7	24.15
C20	22.90
W8	22.90
I3, T10, U1, N4	23.90
West	
C6	25.10
U1	24.40
B3(2)	21.65
South	
C16, U1	23.90
T10	22.90
A8	Cmp*
High-Strength, Low Alloy, East	
B3(2)	23.90
U1, J3	23.90
Midwest	
N4	23.90
W8	24.15
U1	22.90
I3	23.90
West	
U1, A7	24.40
B3(2)	21.65
South	
U1, C16	23.90
Wide Flange, Carbon, East	
B3	23.90
U1, A7, J3	23.90
Midwest	
U1	23.90
N4	23.90
I3	23.90
West	
U1	24.40
C6	24.15
South	
A7	24.15

Strip

Hot-Rolled, Carbon, Cut ll Edge—all widths, East	
U1	23.75
J3, B3	22.05
Midwest	
A7, D1	22.05
I4	21.45
S1, J3, D1	22.05
W3	22.05
N4	22.55
W5	23.75
U1	23.75
B3, G2, I3, M2, R3, G3	22.05
West	
K1	20.80
B3	28.55
South	
R3	22.05
Cold-Rolled, Carbon Max. .25%, East	
E4	29.75
R7, S10	29.60
P15	24.80
S7	Cmp*
U1	36.30
D1(1)	Cmp*
B4	33.60
Midwest	
G4	24.80
I4	35.30
W14	22.95
S1, J4	34.05
T4	Cmp*

*Composite pricing

High-Strength, Hot-Rolled, Low Alloy, Cut Edge & Mill Edge—all widths, (plus extras)†	
Midwest	
M2, G3, R3, W3, I4, J3, G2, I3	22.05
A7	22.05
S1	22.05
West	
K1	22.05
South	
R3	22.05
High-Strength, Cold-Rolled, Low Alloy, Mill Edge, East	
R7	29.00
Midwest	
S1	32.00
Alloy, Hot-Rolled, Midwest (plus extras)†	
S1	24.60
G4	25.80
I4	23.70
Alloy, Cold-Rolled, East	
C11, E4, M8	43.35
R7	32.75
B4	47.25
P15	32.10
Midwest	
I4	41.80
S1	42.30

Sheets

Hot-Rolled, Carbon (18 Ga & Hvyr), East	
B3	22.05
J3	22.05
U1	23.75
Midwest	
A7, B3, G2, G3, I3, M2, R3, W3	22.05
S1, D1	22.05
J3	22.05
I4	21.15
U1, W5	23.75
West	
U1	24.25
K1	22.05
South	
R3	22.05
Cold-Rolled, East, Class I	
B3(2)	26.15
J3	26.15
U1	29.15
Midwest	
B3, I3, G3, R3, M2	26.15
G2, W3, M11	26.15
I4	22.00
J3, A7	26.15
S1, D1	26.15
U1, W5	26.15
West	
U1	28.65
South	
R3	24.65
Galvanized (hot-dipped), East	
B3(2)	28.00
U1	30.30
Midwest	
J3, D1	28.00
I3, S1	28.00
A7, R3, Y1	28.00
G2, W3, M11	28.00
U1, W5	30.30
West	
K1	27.15
U1	30.80
South	
R3	28.00
Enameling, Midwest	
U1	29.85
S1, A7, I3, J3	27.65
Long-Terne, Midwest	
W5	31.65
U1	31.65
R3, A7	29.35

†Actual weight basis

Wire Rod

East	
B3(2)	22.35
U1	22.35
Midwest	
N4	22.35
U1, K2	22.35
West	
A7	22.00
C6	21.45
South	
G7	22.35

Tinplate

Electrolytic Tinplate

	per base box
Single Reduced (70 lb)	
East	
B3, J3	$26.29
U1	27.74
Midwest	
S3	$26.29
U1	27.74
J3	26.29
M11	26.29
W3	26.29
W5	26.29
West	
K1	$26.79
U1	28.24
South	
U1	$27.74
Double Reduced (55 lb)**	
Midwest	
M11	$21.49
B3, J3	21.49
U1	22.37
W3	21.49
W5	21.49
West	
K1	$21.99
U1	22.87
South	
U1	$22.37
Black Plate	
Single Reduced (75 lb)*	
East	
B3	$23.36
Midwest	
J3	$24.01
M11	24.01
I3, W5	24.01
W3	24.01
U1	25.26
West	
K1	$24.01
U1	25.26
Double Reduced (55 lb)	
East	
B3	$18.93
Midwest	
M11	$18.93
W5	18.93
J3	18.93
W3	18.93
W5	18.93
U1	19.70
West	
U1	$19.70
South	
U1	$19.70

*70 lb—base weight extra 45¢
**50 lb—base weight extra $1.40

Bars

Carbon Steel, Hot-Rolled (Special quality)

East	
R3, K3	25.80
R5	25.80
B3(3), J3	25.80
U1, C10	25.80
Midwest	
A7	23.95
U1, I3, I4, C20, N4	25.50
R3, T10	25.80
K2	25.80
I3	19.50*
West	
R3	25.80
C6	24.45
South	
A8	20.05
A7	25.80
C16	25.80
Cold-Finished Carbon, East	
A11	22.15
R3	33.75
C21	21.15
J3(4), L2	31.00
C2	23.025
M8, W10, T11, S8	31.00
N1	24.475
R4	22.25
B4	31.00
M1	23.025
B4, C10	31.00
Midwest	
B5, W10, Y1, W8, R3, M9	33.25
J3	31.00
B1	19.80
L2	30.75
N8	31.00
P3	19.85+CMS
W14	22.20
J3(3)	31.00
J2	31.00
West	
B5	34.90
R3	37.15
South	
B5	32.85
J3	34.00
C16	24.40
J3	31.95
Alloy, Hot-Rolled, East	
B3(2), R5, K3, C10, U1	27.95
R3	27.95
J3	27.95
Midwest	
A7, U1, R3	27.95
I3, C10	27.95
I4	24.85
I3	21.00*
West	
B3	27.95
B5	18.50
C6	26.60
South	
A7	24.85
A8	22.00
Alloy, Cold Drawn, East	
L2	35.20
R3, N1, C2	37.90
M1	28.025
R4	25.65
A11	30.50
J3, W10, L2	34.85
T11, S8	34.85
C10	34.85
J3(2)	34.25
Midwest	
R3, C10	37.35
C2	28.275
J3, W10	34.85
P3	22.75
B1	22.70
N9	34.85
L2	34.85
B5	37.10
J3	36.00
J3	34.95
M9	37.10
West	
R3	40.75
South	
J3	35.85
C16	28.00

Plates

Carbon Steel, East	
B3(2), U1	25.75
L4	25.75
P2	25.75
J3	26.75
Midwest	
B3, R3, S1	25.75
I3	24.25
J3, A7	22.80
U1, I4	25.75
R3	26.75
West	
A7, C6, O2	24.25
K1	23.50
U1, B3	25.75
South	
R3	25.75
A7	25.75
U1	25.75
Alloy, East	
B3, J3	33.55
U1, L4	33.55
P2	33.55
J3	34.55
Midwest	
B3	33.55
G2, G3	33.55
I4, U1	33.55
West	
B3	32.05
O2	30.55
K1	31.30
South	
A7	27.55
U1	33.55

Wire

Carbon Steel Wire, East	
B3(2)	27.10
U1	27.70
A11	22.15
Midwest	
U1	27.70
A7, R3	24.60
N4, W7	27.40
K2	24.20
South	
A8	22.85
West	
A7	25.95
C6	24.95